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EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Transit of Chilled or Frozen Meat through the Union.—For more than eighteen months now the transit of chilled or frozen meat through the Union has been prohibited. Owing to the improved position, however, this matter was discussed with Col. G. N. Williams, D.S.O., Union Secretary for Agriculture, during his recent visit to Salisbury, with the result that the following conditions were drawn up and submitted to the Union Government for their approval and acceptance.

Notification has now been received that they have been approved, and it is anticipated that they will be in force by 1st November, 1932.

1. That the meat be drawn from cattle in areas not less than 25 miles from any foot and mouth disease. The cattle to be inspected by a veterinary officer prior to leaving the farm and to be further inspected on arrival at the abattoir

in Bulawayo, and the carcases to be again inspected by a veterinary officer prior to despatch from Bulawayo. The consignments to be accompanied by a certificate to the effect that these inspections have been carried out, that the animals and carcases showed no symptoms of foot and mouth disease and that subsequent to the inspection on the farm they have not been driven through any infected area or brought into contact with any infected animals.

2. Meat must be consigned in through trucks from Rhodesia to the docks.

3. The handling at the docks to be entirely separate from that of any Union meat which might be shipped by the same boat.

Handling in this instance means unloading of trucks, on skids and in stowage.

The unloading, handling and stowing of the meat shall be carried out under the supervision of a Government veterinary officer, subject to such precautions as to the disinfection of clothing and the persons of handling gangs as are necessary.

4. Marks on wrappers to indicate clearly the origin of the meat.

5. Provision to be made for marking and return of trucks used for the conveyance of the meat, and for their disinfection before being used for any other purpose, disinfection when carried out to be under veterinary supervision and direction.

6. In the case of frozen meat, which it may not be possible to move straight from the trucks into the ships, and which it may be necessary therefore to put into cold storage, provision shall be made for such storage to be carried out in separate chambers to those used for Union meat and for their disinfection under veterinary supervision and direction before being used for any other purposes.

Locust Position as at 15th October, 1932.—It is estimated that from twenty to thirty flying swarms of locusts are at present in the Colony, and they are, as a general rule, maintaining a westerly to south-westerly direction of flight

Comparatively little damage has been reported, and they appear to feed generally on the young growth of grass in the vleis.

No reports of egg-laying have been received, and an examination of the insects themselves indicates that they will not be in a condition for egg-laying for some time to come.

There appears to be only the one species concerned, namely, the tropical migratory locust (*Locusta migratorioides*).

Some swarms have traversed the whole breadth of the Colony from the north-eastern border to the Bechuanaland border, and it is possible that some swarms may have already crossed into Bechuanaland territory.

Special Warning to Tobacco Growers.—The attention of all tobacco growers is again directed to an article in this issue by Mr. M. C. Mossop, and also to the report on Leaf Curl in Tobacco in Southern Rhodesia by Dr. H. H. Storey, which appeared in the March number. In the latter it was pointed out that the most important control measure for this disease, which is transmitted by a small species of White Fly, is the thorough cleaning up of all tobacco lands as early as possible after the crop has been reaped, and this aspect of the problem is again stressed by Mr. Mossop.

Notification has now been received from Shamva that a serious state of affairs is developing to tobacco growers in that area, and it is highly probable that a similar condition prevails in other tobacco growing districts.

The second growth of tobacco resulting from the old plants being left in the land after the crop was harvested is now showing infection from Leaf Curl and Mosaic.

The danger of allowing this state of affairs to arise should be perfectly obvious to tobacco growers, and indicates that there is a serious lack of appreciation of the danger which exists.

No tobacco should have been allowed to grow in the field after the tobacco was harvested, and if old lands have

not been thoroughly cleaned, no time should be lost in doing so now.

From the reports which have been received recently, it appears that there are several farms on which tobacco was grown last year and on which it is not intended to grow tobacco during the coming season. In two cases at least it appears that the old plants are still standing on these farms, and it is suggested that even though tobacco is not to be grown the next season, the land should be immediately cleared even if considered from the viewpoint of public interest only.

Owing to the state of affairs which is indicated, it is recommended that special vigilance should be given to seed beds in order that they be preserved from infection, and the utmost care should be taken to avoid transferring infection from the seed bed to the land.

Should the grower be uncertain as to the identity of the White Fly, the Entomological Branch of this Department will be glad to assist if specimens are submitted for identification.

Paper Floors.—During the last few years several enquiries have been received regarding the making of paper floors. We are indebted to a subscriber for the following information, which we are in a position to say gives very satisfactory results.

After measuring up the surface take sufficient old paper to allow two pounds to every square foot of the floor to be covered. Old newspapers are excellent for this purpose. Tear the paper as small as possible, and soak for three or four days in water and then have it stamped in an ordinary mealie stamp until a fine pulp results. Care should be taken that no pieces of the paper remain in the pulp. If this is not possible the old paper may be boiled in a drum with a small quantity of caustic soda. The resulting pulp is then mixed with a thin porridge of mealie meal, or better still, rapoko meal, allowing about ¾ lb. of porridge to every square foot of surface. This mixture is then laid by hand about ½ inch thick over any comparatively smooth, hard floor; concrete floors are particularly suitable. When the whole surface

is covered, the doors and windows should be closed so that the covering may dry evenly. After about two days the surface should be again smeared with the rapoko porridge and then rubbed with a smooth object such as a bottle, smooth stone or iron until the surface is as smooth and even as possible. When the surface is dry it should be rubbed over with boiled linseed oil, after which it can be polished or stained in the ordinary manner. If properly done the floor becomes very hard and shiny, lasts well, and is very pleasant to walk on, being as soft and soundless as cork linoleum. It is advisable, however, to place small wooden rests under heavy furniture such as the legs of beds, tables, piano, etc., and it is further advisable to use small mats near the doors or wherever there is excessive walking.

Rothamsted Experiment Station.—The Report for 1931 of Rothamsted Experiment Station contains the results of many experiments dealing with three problems that are of great importance in the present conditions of agriculture:—

(1) The most efficient use of artificial fertilisers on grass and arable land;

(2) the provision of keep for animals when farm supplies fall short;

(3) the maintenance of soil fertility in regions where mechanisation is advancing and live stock is being reduced.

The experiments on the manuring of grassland have led to some important results. Nitrogenous manuring has increased the growth of grass, but depressed the growth of clover. Phosphates, on the other hand, increase the proportion of clover in the herbage and so add greatly to its protein content. Phosphates, however, differ in their availability to plants and much valuable information on this point, dealing with a variety of soils and weather conditions, is contained in the Report.

The manuring of a fodder mixture differs from that of a single crop on account of the element of competition among the plants themselves. The crops without manure, or with potash or with phosphate only, are rich in protein, and have a high starch equivalent and so make excellent feeds. On the other hand, nitrogenous manures increase the growth

of the cereal component, but reduce that of the vetches and peas. The result is that the total produce per acre is larger, but the feeding value is entirely altered. It does not contain increased protein, but increased starch equivalent and resembles hay of a moderate quality.

The work on legume inoculation has been successfully introduced into farming practice, and search has begun for new strains of organisms even more efficient than the one at present available to farmers.

Mechanisation being usually combined with a reduction in live stock brings forward the problem of maintaining soil fertility.

Four important problems are being investigated at Rothamsted:—

(1) Can fertility be sufficiently maintained by artificial fertilisers or is it necessary to return the straw to the land in the form of manure, and if the straw must be returned what is the best method?

(2) Is it possible to produce, by any cultural process, the same good effects on light land as are obtained by sheep folding?

(3) Effects of green manuring.

(4) Effects of fallowing.

The results so far obtained are contained in the Report.

The laboratory investigations, although highly technical in character, are an essential part of the Rothamsted programme; they provide the scientific knowledge on which improvements in agricultural methods must be based.

Additional rapid methods of testing and classifying soil have been introduced, one of which—the "Pachimeter" test—is also likely to be of use outside the sphere of soil investigations.

The results of researches on the micro-biological activities in soil have been applied with success to the problem of purifying the effluent from sugar beet factories.

Progress has been made in the very difficult problem of virus diseases in plants. The virus has been shown not to travel in the transpiration or water stream; and its entry into

a cell is accompanied by marked increase in the respiration rate.

The Report gives full summaries of 62 scientific papers published during the year and a list of 40 articles dealing with technical aspects of agriculture.

Pig-feeding Experiments.—The first pig-feeding report of the Harper Adams Agricultural College summarises the experiments in pig-feeding carried out between 1926 and 1931. Briefly, these showed that a ration of cereal meals was deficient in proteins and certain minerals for the needs of a rapidly growing pig, but that extracted soya meal, supplemented by lime and salt, gave as good results as fish meal when added to a cereal ration. An average proportion of about eight per cent. of soya meal was found to be adequate, this being best secured by using about twelve per cent. in the ration for a newly weaned pig, and gradually reducing this to a minimum of five per cent. at bacon weights. A mineral allowance of 1½ lbs. limestone and ½ lb. salt per 100 lbs. mixed meals was sufficient, and this seemed to be as effective as the more complex and expensive mixtures containing a great variety of minerals. For sty-fed pigs under normal conditions about 3 lbs. of water per 0.1 lb. meal were needed for young pigs, but this amount could be reduced to 1¾ lbs. at bacon weights—a little more being allowed in hot weather. Many factors affect the economic value of milk in pig-feeding, and although whole milk gave a higher rate of gain than separated milk, yet the financial returns were lower than those obtainable by feeding separated milk, in conjunction with butter making or cream selling.—(*Nature*, 24th September, 1932.)

Club Cheese.—Often the housewife has a piece of cheddar cheese that has become too dry to put on the table. This can easily be converted into club cheese, which makes a nice change from the ordinary type and is ideal for sandwiches.

To prepare it, cut off all rind from the cheese, and pass it through the meat mincer. Now mix butter with it in the

proportion of one ounce of butter to eight to ten ounces of cheese. Pass the mixture of butter and cheese through the mincer again, which should free it from all lumps. It is now ready for use.

It can be packed in air-tight glass jars, care being taken not to leave any air-space between the cheese and the glass.

Cheese and butter of good flavour should be used. The stronger the flavour of the cheddar cheese the stronger will be the flavour of the club cheese. More butter is required with a very dry cheese than with a moist one, in order to make the texture soft, but if the cheese is to be kept a long while, too much butter is liable to make it rancid.

Sometimes a little pepper is added, to give the cheese a biting taste.—(Union of South Africa Press Service, October, 1932.)

Commercial Travellers' Samples: Customs Facilities, United Kingdom.—*Importation.*—Articles liable to Customs duty (other than cinematograph films, motor cars, motor car chasses and motor cycles) imported from all parts of the British Empire as commercial travellers' samples or specimens (whether or not accompanied by the commercial traveller) are temporarily admitted without payment of the duty to which the goods are liable, subject to the amount thereof being deposited in cash or secured by bond before their delivery out of official charge.

The traveller or his agent is required to produce a list containing a description, sufficiently full for identification purposes, of the samples or specimens imported, and, in the case of goods liable to duty on an *ad valorem* basis, a statement of their value. The value to be shown in the statement in the price which an importer would give for the goods, if they were delivered, freight and insurance paid (but not duty paid), at the port of importation. It is the price which would be paid on a *bona fide* purchase at the ship's side in this country.

The list (and statement where neeessary) should be officially attested by the proper authority in the country of exportation. If, on arrival of the samples or specimens, no

list is available, one may be compiled at the port of importation, in which case documentary evidence of value must be produced for any of the samples or specimens which are liable to duty on an *ad valorem* basis.

Examination of samples or specimens will be limited to ascertaining that they are fully described on the list, and, in the case of goods chargeable on an *ad valorem* basis, that their value is correctly stated.

If the samples and specimens bear the marks, stamps or seals of the country of exportation, no additional marks or seals for purposes of identification will, as a rule, be affixed by officers of Customs and Excise. If the samples or specimens bear no marks, stamps or seals, they may be marked or sealed for future identification.

The list of samples or specimens will be signed and dated by the officer of Customs and Excise, who will affix a statement bearing an official seal or stamp and showing—

(a) the port of importation and the amount of duty chargeable; also whether duty was deposited in money or bond given;

(b) the marks, if any, applied by him to the samples or specimens;

(c) the date on which the duty deposited will be carried to the public account, or recovered under the security given, unless it is proved that the samples or specimens have been previously exported or placed in bond. This date will not be later than twelve months from that upon which the samples or specimens were imported. No charge is made for the document or certificate issued or certified by the officers or for marking for identification.

Re-exportation.—Samples and specimens of dutiable articles imported under these regulations may be produced to the officers of Customs and Excise for examination prior to exportation, and to obtain refund of the deposit on release from the bond given on importation, subject to declaration in respect of any samples or specimens not produced for re-exportation. The list and statement (previously mentioned) must be produced with the goods.

Prior to the re-exportation of goods chargeable to duty on an *ad valorem* basis, a declaration signed in the presence of an officer must be produced with the goods, stating that they have not been used in Great Britain or Northern Ireland for any other purpose than as commercial travellers' samples or specimens, and that they are in all respects identical with the goods imported.

If the samples or specimens of dutiable goods are not re-exported or placed in bond within the prescribed time (not later than twelve months) the duty deposited will be brought to account or the bond put in force.

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

CULTURAL METHODS AND TOBACCO WHITEFLY IN SOUTHERN RHODESIA.

By M. C. Mossop, M.Sc., Entomologist.

About a year ago it first became evident that leaf curl of tobacco might become a problem of primary importance to the tobacco grower. Previously known as "Frenching," it was considered to be of sufficient importance to warrant the destruction of infected plants. During the season 1931-32, however, the disease came into greater prominence, and specimens brought into Salisbury revealed that a species of whitefly (Family *Aleyrodidæ*) was present in fair numbers. Other insects suspected of being vectors of the disease were also present, but Hopkins* has explained how the Plant Pathological and Entomological Branches co-operated to show that the disease was transmitted by the whitefly.

In his article Hopkins also produces evidence that the disease and insect vector were carried over the winter in volunteer plants. In order to confirm this, and to find out to what extent volunteer plants are responsible, a visit was made in September to one of the large tobacco growing areas that had been inspected last season.

On a few farms no effort whatsoever had been made to remove the previous season's plants. On at least one there was no intention of removing them, as the land in question was not to be used this year, although tobacco was to be grown nearby. Whitefly was to be found in small numbers in this land, and the presence of the disease was also evident. In other cases it was the intention to remove the plants and plough the land at an early date.

* Hopkins, J. C. F.: "Further Notes on Leaf Curl of Tobacco in Southern Rhodesia."—*Rhodesia Agricultural Journal*, XXIX., 9, Sept., 1932.

Lands on other farms supported up to more than fifty per cent. re-growth from plants cut off below the soil after last season's crop had been harvested. Both whitefly and leaf curl could be found on such lands. A lower, although distressingly large, percentage of volunteer plants was found on lands where the plants had been pulled up after the preceding season. These plants had grown from portions of roots broken off in the pulling operations. The lands had not been ploughed and the volunteers had attained a sturdy growth. Whitefly and leaf curl were found on these lands.

Tobacco lands that had been ploughed within the previous few weeks were also examined. Whatever method of removing the plants had been adopted, these lands supported at least a small population of volunteer plants, and, young as the plants were, leaf curl could usually be found, although whitefly was frequently not discovered. Small but stnrdy plants, some diseased, could be found growing from ploughed-in stalks, and from pieces of root.

Old seed beds, from which most or all of the plants had been pulled, also supported a population of plants on which both the insect and the disease were present. Usnally these plants had sprung either from remains of roots or from seeds shed by neglected plants.

In sheltered places, such as against the walls of barns and other buildings, vigorous plants were found, differing from the field volunteers by their breadth of leaf and lack of bedraggled appearance. Some of these harboured whitefly in large numbers and in all stages of development, and leaf curl was also to be found.

In Salisbury observations have shown that the whitefly breeds slowly and in small numbers during the winter months on tobacco plants growing in sheltered places. From August onwards there is a gradual increase in numhers, and by the middle of Octoher the insects are plentiful, though they may still be scarce in the fields at this time.

It has also been noticed that leaf curl can and does persist in a given plant throughout the winter, and that roots of a diseased plant from which the stalks have been cut below ground can give rise to suckers with obvious signs

of the disease in the absence of whitefly. Old diseased plants, however, do not necessarily retain the symptoms, although the plant remains infected and may show the symptoms when it suckers.

In a family of insects that has been rather neglected from the systematic standpoint, it is often difficult for the economic entomologist to distinguish one species from another. This is the case with the whiteflies, and although we recognise two very distinct forms of importance in Salisbury, we may be dealing with several species. It is probable that the insect known as tobacco whitefly is a distinct species, and this is thought to be a species of *Bemisia*.

Plants on which the tobacco whitefly has been found to breed are tobacco, cotton, tomato, *Vernonia* sp., sowthistle (*Sonchus oleraceus*, L.) and pigweed (*Amaranthus graecizans*, L.). On farms it has been found on tobacco, cotton, sowthistle and pigweed. There are almost certainly other host plants of the insect and of the disease. *Ageratum* is suspected of being a host of both.

The common whitefly, another species, which has not been found on tobacco in the field has been reared from egg to adult on tobacco in Salisbury. This has been observed to breed, either in the field or insectary, on at least eight species of plants, including blackjack (*Bidens pilosa*, L.). It is not known whether it can transmit leaf curl disease to tobacco, but as it has not been found breeding on tobacco plants in the field, it would seem of minor importance in this connection. It is parasitised by a species of *Prospaltella* (Family *Aphelinidæ*) which may yet be found to attack the tobacco whitefly.

Tentative recommendations for control have been set forth by Hopkins in his paper already referred to. Our present knowledge of the insect vector and of the disease strengthens the opinion that these recommendations should be carried out. To state the case briefly, cultural practice should be modified as far as possible to ensure the complete eradication of volunteer plants as soon after harvesting as can be accomplished.

To carry out such a plan seems a formidable undertaking, but it can be done. The plants should be pulled out and

burned soon after the crop is harvested. The longer they are left, the harder to pull they become, and the greater is the likelihood of roots being broken and left behind. Pulling should be followed immediately by ploughing. These operations are no more than are normally advised in tobacco culture. But they should be followed by the removal and destruction of stumps and roots by a gang of natives under reliable supervision. Thereafter, it should be the duty of as many natives as circumstances necessitate to go over the lands—say once a fortnight or once a month—and dig up any roots the presence of which may be made evident by their suckers. In many cases one native will be sufficient for this work.

The above practice has been advised for the control of other insect pests and other plant diseases of tobacco. The appearance of an insect pest and a virus disease newly recognised in Rhodesia makes this practice all the more necessary, and the grower who has carried it out in previous years will find no added expense in pest control. If the grower who has neglected it in the past will fall into line, he should find tobacco a more profitable crop. It is obvious that tobacco lands that are to be used for a different crop must receive the same treatment. A clean tobacco land is not sufficient—the neighbourhood also must be clean.

Volunteer plants in and around seed beds and gardens and growing near barns and in similar sheltered places should not be overlooked. Seed beds in use should be covered as usual with tobacco cloth. Although the effect of tobacco extract on whitefly has not yet been demonstrated, it would be advisable, if there is any suspicion of the presence of the insect, to add one part by volume of the 6 to 8 per cent. extract to every 80 parts of Bordeaux Mixture used on the seed beds.

Lastly, weeds must be kept down. Pigweed and sow-thistle are prone to grow in localities prepared for seed beds, and in old seed beds. Other weeds may be hosts of the white-fly and leaf curl and should be suppressed.

WIND-BREAKS AND SHELTER BELTS.

By A. A. Pardy, B.Sc. (Forestry), Forestry Division.

Definition of a Wind-break.—A wind-break is any natural or artificial barrier which effectively checks wind velocity. For example any of the following may form wind-breaks: Hills, walls, trees and hedges.

This article deals with wind-breaks of trees with a few remarks on hedges.

Objects and Advantages of a Wind-break.—The objects of a wind-break are many, the chief of which are:—

1. To reduce evaporation from soils and transpiration from leaves.

2. To shelter an orchard or other crop in order that flowers and fruit may not be blown off and to make conditions more favourable for insect pollination; also to reduce heat and frost damage.

3. To shelter stock from the heat of the day during hot weather and cold winds during the dry season.

4. To provide fuel and timber required on the farm.

5. To prevent erosion of the soil by wind and water.

6. To beautify the homestead.

Disadvantages.—The above advantages may be offset to some extent by certain disadvantages, which include the following:—

1. A certain amount of food and moisture is removed from the soil and may have a deleterious effect on adjacent crops. This effect is not appreciable until wind-breaks have reached some size and are making definite demands on the soil.

Such a disadvantage may be greatly reduced by trenching some distance from the wind-break or utilising the ground along the belts of trees for roads.

2. By improper attention to density the desired effect may not be produced. This may be obviated by a little forethought at the time of planting and devoting attention to the formation and density of the belt.

3. A certain amount of good farm land may be occupied. If this should be an important consideration it must not be overlooked that land carrying a crop of trees is of both direct and indirect benefit to the property.

In summing up it is considered that any disadvantages are far outweighed by the advantages.

The Action of Wind-breaks.—When forming a wind-break its functions and actions should be borne in mind.

A wind-break is essentially for checking a wind. It should, however, not entirely restrict wind penetration or the advantage may be greatly reduced.

If a wind-break is insufficiently dense, too much wind is allowed to pass through it. On the other hand if the wind break is too dense the wind strikes and is turned over it with considerable force on to the protected area some distance from the break, whilst the air adjacent and to the leeward side of the break remains stagnant.

If the correct density is obtained then a certain amount of wind is allowed to percolate through the belt and the desired effect is produced. The percolating wind acts as a cushion for diverting the wind which comes down from over the break. In addition, this gentle current of air prevents any stagnation of the atmosphere.

The sheltering effects of a wind-break are felt for two to five times its height on the windward side and from ten to twenty times on the leeward side. Figure 1 illustrates these points.

If planted with fast growing species a wind-break has an appreciable effect when two to three years old, and by eight to ten years it should be fully effective.

Types of Wind-breaks.—Wind-breaks and shelter belts may be strips or groups of indigenous trees left when stumping new land. The cost of forming and maintaining such wind-breaks should be nil.

Wind-breaks may also be formed of single or multiple rows or groups of exotic trees.

I. *Single Rows.*—These have the advantage of occupying little space and should be used only when economy of space is an important consideration or as an auxiliary belt. They are not recommended as main belts.

If a single row is planted each tree in that row requires to be functioning to the best advantage. If one or two trees in the row are in poor condition, have been killed by fire or thrown by the wind an ineffective wind-break might result. Furthermore, if the belt has been planted with fast-growing species the lower portion of the belt is apt to open out with advancing age and if planted with a slow-growing species it takes some time before the belt becomes effective.

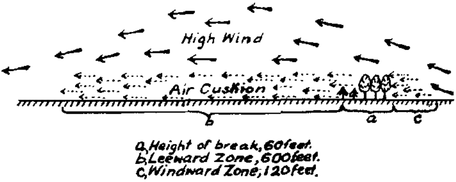


Fig. 1. Zones of effect. Average wind-break of eucalypts and conifers.

Another disadvantage of a single row break is that little latitude is allowed for the removal of certain trees for fuel or timber.

II. *Two Rows.*—When two rows are employed one should be of tall fast-growing trees and the other of slower and more bushy ones. For such a purpose a very suitable combination is to have a row of eucalypts on the windward side and a row of conifers or other slower growing species on the leeward side.

III. *Three Rows.*—By using a wind-break of three rows of trees still greater protection is afforded and there is more scope for the removal of trees for fuel or timber. Such a wind-break could consist of two rows of eucalypts with a row of conifers on the leeward side or one row of eucalypts with two rows of conifers on the leeward side.

Of these two possibilities the former, from the point of view of a wind-break and for fuel and timber production at an early date, is preferable.

IV. *More than Three Rows.*—A wind-break of more than three rows in addition to being used for shelter can, by regulated cuttings, be used for the production of timber and fuel. Such a belt may consist of one or more rows of eucalypts and one or more rows of conifers or other slow-growing species. *Vide* photographs, figures 3 and 4.

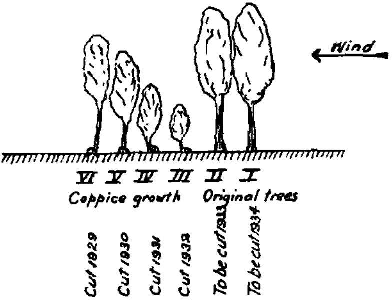


Fig. 2. To illustrate coppicing in six-row eucalypt wind-break, planted 1924.

A method of managing a eucalypt break for the dual purpose of protection and provision of timber is illustrated in Figure 2. Six rows of eucalypts were planted at the end of 1924, and five years later row No. VI. was felled, a year later row No. V. and a year later the row represented by tree No. IV. was felled, and so on. The result of this method of management is that a break results with both an upper and lower storey opposed to the velocity of the wind. In addition, there is also being produced small timber and fuel.

V. *Trees Singly and in Groups.*—This type of shelter is more suited for planting in areas devoted to cattle grazing and in the vicinity of homesteads.

To serve as a shelter for cattle the trees may be planted singly or in groups. A modification of the group method

would be to leave the trees planted as an open ring to allow of cattle sheltering inside.

Ant heaps might be planted in some of the cattle rearing areas. The trees used for such shelter might include the Beefwood and Belhambra as extra food for the stock.

Such groups of trees would require protection by fencing until such time as they are no longer liable to damage by stock.

The principles embodied in the aforementioned remarks concerning exotic trees apply to indigenous trees.

General.—Trees should be conserved or planted in water catchment areas and near dams, as they lessen rapid run off and so do much in preventing erosion. They also regulate the water supply and reduce surface evaporation.

In the vicinity of homesteads trees along a drive or scattered individually or in groups have a very real effect in sheltering and beautifying a farm. In addition, they provide restfulness to the mind and an appearance of prosperity to the farm.

Hedges.—Hedges are very beneficial round buildings and gardens, providing both beauty and a lower form of shelter. If it is worth while planting a hedge it is worth while looking after it. Very often poor straggling hedges are seen which, with a little care and attention from the beginning, would have been fine, close and imposing.

The common hedge plants such as Cypresses, Callitris, Camphor laurel, Bottlebrush and Privet should be planted about one foot apart. Tecoma, Mulberry and Hibiscus may be planted three feet apart, and such plants as the Macartney rose, Bougainvillea and Granadilla should be planted with an espacement of five to nine feet. Apart from the conifers and climbers, the above-mentioned plants should be cut back to about six inches when they become established to encourage thick growth. With each foot of growth the hedge should be cut back six inches until the desired height is reached. In order to allow light to reach all parts of the hedge, it should be cut in the shape of a triangle or truncated cone in end view.

The cutting of coniferous hedges should be on the same principles. The entire removal of branchlets and leaves must, however, be avoided, as, ordinarily, these plants do not coppice from the stump.

Choice of Site.—In choosing the ground for planting, the main consideration is the quantity of water available for the trees. It is unwise to plant on shallower soils unless irrigation is to be carried out, as these soils are likely to dry out during the long dry seasons. It is very inadvisable also to plant badly drained areas. The ideal aim is a deep, fresh, well-drained soil which has sufficient sub-soil moisture to carry the trees through the dry seasons.

In areas subject to frost only trees of known frost hardiness should be planted.

Good growth of indigenous trees is a very good indication of good soil for exotic trees. On the other hand, lack of indigenous tree growth does not necessarily mean that such ground is unsuited for tree growth. It may, however, be due to shallowness of soil, a laterite pan or bad drainage. In such cases it is advisable not to plant. If it is considered vital to have some form of shelter on shallow soils, then only the hardiest of trees should be planted and, if possible, irrigated.

Preparation of Land for Planting.—Land for planting should be stumped a year in advance and the wood utilised as far as possible The material which is not utilisable should be piled and burned and efforts made to conserve fallen leaves and other accumulated organic matter.

It is better to plant in virgin land rather than land which has carried agricultural crops. Soils which have carried crops other than trees are often deficient in organic matter, which is necessary for the life of a tree.

Lack of organic matter in the soil encourages depredations by "white ants." "White ants" prefer dead matter, but if that is not available they are likely to attack living plants.

In worked-out lands weed growth is usually heavy, and unless frequent weeding and cultivating are carried out, the young plants are liable to be robbed of water and to be suffocated.

Thorough ploughing should be carried out in late summer to loosen and aerate the soil and to turn in organic matter. In the following summer the ground should be *cross ploughed and a good harrowing given prior to planting.*

On sloping ground where soil erosion is feared, a rough ploughing without harrowing is advisable. At the time of planting, a small patch is levelled for each plant with spade or hoe. If the ground is too steep for ploughing, hoeing should be resorted to.

Planting.—The planting distance may be that advised in this country for plantations, namely, ordinary 6 ft. x 6 ft. square planting. Greater planting distances may be used for wind-breaks, as the formation of branchy trees in a wind-break is advantageous. A planting distance up to 12 ft. x 12 ft. may be adopted on the quincunx planting system, which is to say the trees are planted 12 ft. x 12 ft., and in the centre of each square thus formed another tree is planted. Such a system provides an efficient wind-break.

The sites for the trees should be marked on the ground by means of a planting chain. The planting chain may be any form of chain or rope, with the planting distances marked with tags.

Plants are then set out, due regard being paid to the following rules for tree planting: Plant during dull or showery weather; discard plants with poor root systems and cut back roots when too long or bent; take care that the finer roots are not injured when transferring from nursery to planting site; place the roots of the young plants in as natural a position as possible and avoid bending the roots; place the young trees in the ground at the same depth as they occupied in the trays or nursery beds, making an allowance for the settling of the soil.

Cultivating and Tending.—When blanks occur early in the life of the plantations, they should be filled in with fresh plants.

Subsequently the plantation should be cultivated and weeded. This is done in order to conserve the soil moisture and reduce weed competition. A farm cultivator, hoes or spades may be used in this operation. The killed weed

growth should not be removed but left on the ground as a mulch and to decompose into plant food.

In areas where soil erosion is feared, cultivating and weeding should be reduced to a minimum. Weeding should take the form of slashing down, but not cutting out, undesirable growth.

In cultivating, care must be exercised not to heap the soil round the base of the trees. This seriously interferes with the growth of the tree and may eventually cause its death.

Cultivating and weeding should be carried out at least once a year, until the young plantation forms canopy. In the case of the fast-growing species, this may occur after two years, but in the case of slow-growing species, it may be three to five years before canopy is formed.

If the belt of trees planted is to be treated simply as a wind-break, little attention is necessary after canopy is formed. On the other hand, if the objects are to produce timber and fuel as well as shelter, it may be advantageous to carry out judicious pruning, cleaning and thinning.

Great care should be taken in the performance of these operations.

Trees with double leaders should be pruned to a single stem and abnormal branches removed. The pruning of normal branches should be strictly avoided. These will eventually be killed, as the branches of adjoining trees are knit together and light thereby cut off from them. Till then they are carrying out important functions by feeding the tree, by keeping the ground shaded and cool and reducing evaporation from the soil.

"Cleaning" or a light thinning may be necessary soon after the plantation has formed canopy. In this operation only such trees as are diseased, crooked or are interfering with the growth of good trees should be removed.

Thinning is carried out on the same principle. Diseased and suppressed trees should be removed first, and before any of the other trees are removed each should be considered on its merits—whether it is interfering with successful growth of adjacent trees, whether it can be

Fig. 3. Wind-break of eucalypts.

Fig. 4. Wind-break of eucalypts and conifers.

utilised and whether its removal will cause a serious gap in the plantation. Good thinning will increase the increment capacity of the crop and bad thinning the reverse.

Protection.—The most destructive agency to a plantation is fire. Adequate steps should therefore be taken to have the plantation protected from fire by fire breaks. These may be ploughed between which the grass has been burned off.

Fencing may be necessary in the young stages if cattle have access to the plantation.

Suitable Species for Planting.—For wind-break species of Eucalypts, Conifers and other trees are suitable.

Climate and depth of soil must determine whether the hardy or less hardy of the common exotics should be employed for planting. Unless these factors are known, it is impossible to offer definite advice for any particular case.

The following trees are recommended for wind-break plantations, the hardier and more suitable species for general planting being marked with an asterisk:—

Eucalypts.—*E. botryoides, E. citriodora, E. globulus, E. maideni, E. maculata, E. melliodora, E. paniculata, *E. punctata, E. resinifera, *E. rostrata, E. saligna, *E. tereticornis.*

Conifers.—**Callitris calcarata, *Callitris robusta, Cupressus arizonica, Cupressus lusitanica, *Cupressus torulosa, *Pinus canariensis, *Pinus halepensis, Pinus insignis, Pinus longifolia, Thuya orientalis.*

Other Species.—**Casuarina* sp., *Cedrela toona, *Morus* sp.

TRAP NESTS.

By B. G. Gundry, A.I.Mech.E.

Trap nests of various designs have been tried out at the Government Poultry Station, but the two types described herein have proved the most satisfactory and are recommended with confidence by the officers of the Poultry Division.

The "Roller" Type.—In the following descriptions the two parts of the trap nest are referred to separately, as follows:—

(a) The nest or box in which the hen lays the eggs.

(b) The trap which allows the hen to enter the nest but prevents her leaving it until released.

In the roller type the trap consists of a frame of wood and wire which swings about an axis through approximately 90 degrees between the open and closed position.

The two pieces of board forming the side pieces of the trap or roller should be not less than ¾ in. thick, and, if possible, 8½ ins. wide so that joints are unnecessary. The ends of a petrol box will serve admirably. These end pieces are cut to the shape shown in the drawing and are joined together with three cross pieces. These cross pieces must be cut square at the ends and to exactly the same length, i.e., about 9½ ins. for all breeds or 7 ins. for light breeds only. These dimensions may, however, be varied somewhat if necessary to fit a particular nest box.

The wooden frame of the trap having been nailed or screwed together, the front part is covered with 1 in. or ½ in. mesh wire netting, which extends from the cross piece B to the crosspiece C. The dimensions given for locating the holes for the axis bolts about which the trap revolves are taken from the actual trap from which the drawing was

made, but it must be realised that any appreciable variation in the details of construction may result in these holes having to be placed somewhat differently; it is advisable, therefore, before drilling the bolt holes to test the balance as follows: Drive a thin nail into each side at the point given by the dimensions, 4½ ins. from the top edge and 4 ins. from the front edge. Now support the trap temporarily by these nails and hold it in the open position, raise the back gently two or three inches as would be done by a hen entering the nest. If the trap is properly adjusted it should then overbalance and fall gently into the closed position. If it does not function correctly, the position of the nails should be altered as indicated by its behaviour until it does so.

If any difficulty is experienced in ascertaining the correct position for the axis bolts, the following procedure may be adopted: Hold the trap between the points of two nails held firmly in the hands in such a way that it will balance about its centre of gravity like a wheel; the correct position of the nails will be determined after a few trials. Now, from the dents made by the nails—which should be exactly opposite each other on either side of the trap—measure off a distance of ½ in. from this point away from and roughly in line with the top right hand corner of the trap when facing to the right. This point will be the position for the bolt holes, which can now be drilled.

Care should be taken that these traps are not too delicately poised, or they are liable to be closed by accidental causes.

The nest box in which the trap is fitted should be approximately of the size shown. The inside width should be about ¼ in. wider than that of the trap to permit the latter to swing freely. The height of the back cross piece of the trap, when open, above the front edge of the nest should be not less than 2½ ins. or more than 4 ins., and the trap might, if convenient, be set a little further back in the box than that shown.

If the trap, when open, projects beyond the end of the box as it does in the drawing, the lid or a fixed piece of wood must project just beyond it so that it will not be accidentally closed by a bird alighting on it.

The trap may be swung on ordinary screws or even nails, but bolts, as shown in the drawing, will be found very much more convenient and reliable, as with them the trap can be set in the proper position and will remain in adjustment.

Before drilling the holes in the box for the axis bolts, it is as well to place the trap in the open position in the box and hang it temporarily with thin nails driven into the sides of the box from inside the trap; its correct placing can thus be determined.

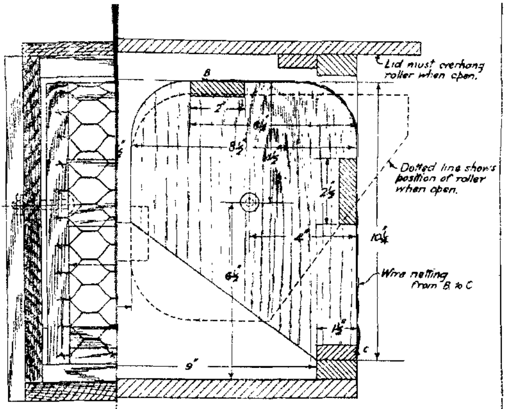
When completed, the trap nest should be painted inside and outside with some insect-resisting compound such as carbolinium.

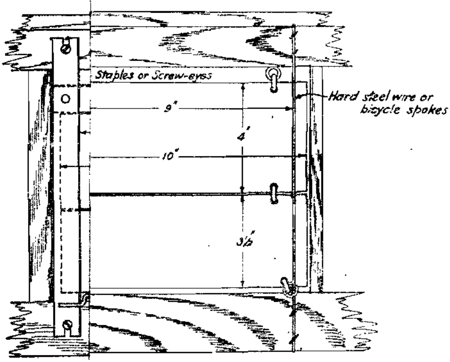
The "Venetian Blind" Type.—There are two methods of constructing this type of trap. In the first, the two thin metal plates which are linked together by wire rings are suspended from a metal frame, the sides of which form a guide for the lower plate as it slides up and down. In the second method the top plate is attached direct to the upper edge of the nest box, and the lower plate is guided by two rigid vertical wires also attached to the front of the nest box.

The first method of construction is most suitable, where the traps are to be fitted to a battery of nests arranged in rows or tiers, each compartment having its own trap.

Both the frame and the plates are made from flat galvanised iron of 22 or 24 gauge.

The frame consists of three strips of this material 1¼ ins. wide and of the required length, one edge of which must be turned to a right angle to give it the necessary rigidity. The turning of these edges may present some little difficulty, and the following method of procedure is suggested: If a carpenter's or fitter's vice is available, the edge of the iron to be bent may be inserted between the jaws to a depth of ¼ in. and tightly gripped in this position. The projecting metal can now be bent over and hammered down flat to form a neat angle If the jaws of the vice are not long enough to take the full length of the iron, two pieces of hard wood of the required length may first be placed in the vice and the iron held between them. Failing a vice, the iron can be





FRONT VIEW.
ng alternative method
of construction.

Irrigation Division.

gripped between two such strips of wood held together by small bolts.

The horizontal cross piece may be attached to the vertical side members by $\frac{1}{8}$ in. diameter tinsmith's rivets. The various holes in the plates and frame should be drilled with a twist bit.

The wire bent in the form of a double crank which holds the lower plate in position can be made from ordinary 10 G. galvanised fencing wire.

As in the roller type, the width of the opening, i.e., the distance between the side members of the frame, may vary from 7 ins. for light breeds to $9\frac{1}{2}$ ins. for heavy breeds.

The alternative method of construction, as shown on the right of the drawing, is somewhat simpler and is recommended when petrol tins are used as nest boxes, as no frame is required.

The wires on which the lower plate slides must be smooth, straight and parallel. Bicycle spokes are suggested, but any type of wire may be used provided it is sufficiently stiff and springy to resist permanent distortion by normal use.

TSETSE FLY OPERATIONS IN LOMAGUNDI DISTRICT.

(UMBOE AND SIPOLILO AREAS).

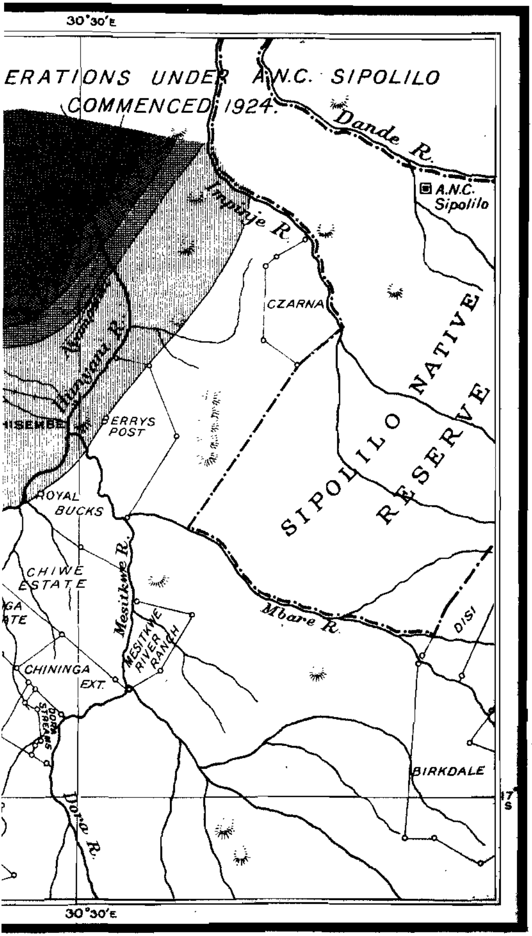
By R. W. JACK, Chief Entomologist.

In the *Rhodesia Agricultural Journal*, February and March, 1926, an article appeared, entitled "Tsetse Fly in the Lomagundi District," in which a history was given of recent aggression of tsetse fly in the Umboe and Sipolilo divisions of that district and also an account of measures undertaken by the Government to combat the menace.

For details concerning the nature of the country and the aggression of the fly, the reader is referred to the article in question, which is still in print as Bulletin No. 587 of the Department of Agriculture.

It may be recalled that the position at that time was very menacing, and that cattle were dying freely from trypanosomiasis (fly disease) on a number of farms both between the Angwa and Hunyani Rivers and on the eastern side of the Hunyani River. In the same area native cattle were decimated by the disease, and native cattle were also dying freely in the northern part of the Sipolilo Reserve and adjacent country. The whole outlook afforded a clear prospect of extensive evacuation of occupied country.

Operations.—The game drive between the game fences which was carried out in November, 1925, although apparently successful at the time, does not appear to have had a very marked effect on the prevalence of game between the fences. In any case a considerable amount of game remained or found its way back into the area. The operations may be said to have commenced in earnest during the last few days of the year 1925. They were carried out by



Drawn and Photo-Lithographed at the Surveyor General's Office, Salisbury, S. Rhodesia. 1932.

native hunters, supervised by a Europeau ranger, distributed over the approximately 300 square miles of country enclosed by the game fences and the Hunyani and Angwa Rivers, the area being about 30 miles long by 10 miles wide. The maximum number of hunters employed in this section was eighteen.

In September, 1927, hunting operations were extended northward to the triangle formed by the Hunyani and Mvume Rivers and the northern game fence.

In July, 1928, operations were extended to a ten-mile zone north of the northern game fence, and a third game fence cutting off the new zone was completed in November of that year. This fence was extended eastward across the Hunyani River to the Impinge River in the Sipolilo sub-district. At the western end the new zone was closed by a cross fence more or less parallel with the Angwa River.

In February, 1930, operations without fencing were extended to the west of the Angwa River, due to indications that the fly was tending to outflank the original area of operations.

In 1931, following the general improvement in the position, it was decided to reduce costs, and the number of paid hunters was reduced from 42 to 12, whilst 30 rifles were issued to selected unpaid hunters resident in the area. Both paid and unpaid hunters remain still under the supervision of the ranger.

From 1924 supplementary operations have been prosecuted by unpaid native hunters resident in the Sipolilo sub-district under the general direction of the Assistant Native Commissioner at Sipolilo.

Game Fences.—The game fences in the Lomagundi district now consist of seven strands of barbed wire, gauge 12½, and are six feet high. The top wire is 18 inches above the next, and three wires are then concentrated about 7½ inches apart, as at this height they take the weight of the average big buck running into the fence.

Considerable experience with these fences has now accumulated not only in the Lomagundi (Umboe) area but elsewhere, and on the whole they have proved reasonably

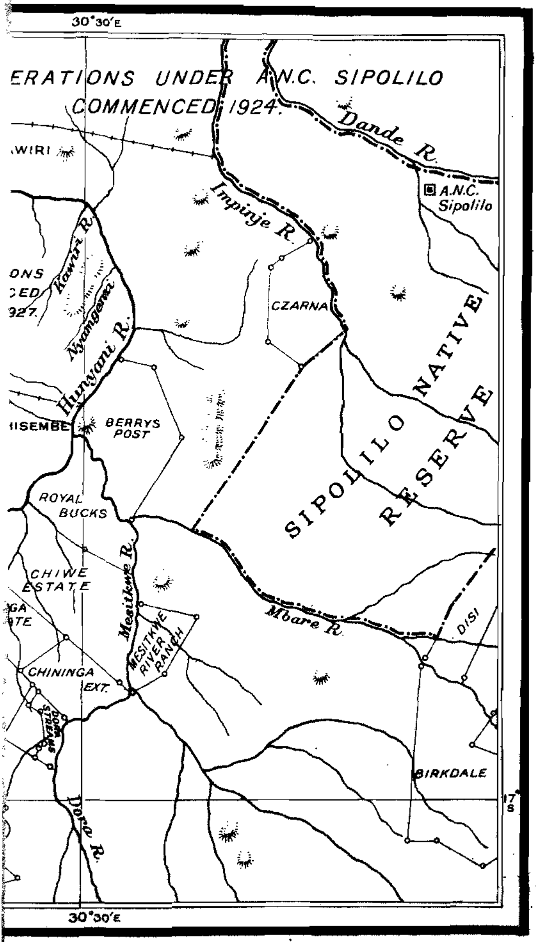
satisfactory. They might, of course, be made both higher and stronger with advantage, but the additional expense involved is an important consideration. Koodoo or even eland can clear a six-foot fence, but in practice they generally fail to see the isolated top wire and so sustain a fall, which seems to deter them from repeating the attempt. As far as strength is concerned, a stampeding herd hitting the fence at right angles breaks through, but this does not occur very often. The experience is that for a period after the new fence is erected, breakages are frequent, but that they diminish almost to the vanishing point in course of time.

The fences would, of course, not be of much avail in areas where elephant and rhinoceros are common, but in the areas where they have been erected they serve a very useful purpose. It should be mentioned that they are regularly patrolled, and breakages are repaired daily. They are also protected from fire each year, and poles are renewed when necessary. As far as possible, living trees and "live poles" are utilised, but in some areas the latter are lacking, together with durable wood. This unfortunately necessitates the use of perishable poles.

The fences in the Lomagundi (Umboe and Sipolilo) area are now altogether about 120 miles in length.

Tsetse Fly.—From the year 1926 an effort was made to obtain an exact knowledge of the distribution of the fly, three special field inspectors being engaged for this purpose. These inspectors were mostly engaged in searching for fly in the areas where trypanosomiasis was prevalent amongst stock, that is, on the extreme boundary of the fly-infested area, and also between the two first erected fences. On Map 1, illustrating this article, the results of inspection in the years 1925 and 1926 are shown by various shadings indicating the distribution and density of the fly as ascertained by direct inspection.

It may be noted that density is calculated on the basis of the number of male flies caught in one net in an hour. It will be noted that, except close to the second fence, this density was under one, and in actual fact was very much



Drawn and Photo Lithographed at the Surveyor General's Office, Salisbury, S. Rhodesia.

so in most places. Flies were scarce in the area marked, but were to be found by intensive search.

The area *north of the second fence was maintained* as a temporary game reserve in 1926 and 1927, and was known to be heavily infested with fly on the basis of traverse by various officers of the Entomological Branch. It was not until 1927, however, that detailed density counts were made. Mr. J. K. Chorley, Entomologist, was stationed in this area in that and the succeeding year, studying the effect on the tsetse of organised grass burning, and obtained a series of figures based on fortnightly collections in certain selected localities from August to December, 1927.

It is to be noted that practicable methods of estimating density do not give closely comparable results, but they do, of course, give results which are reliable on broad lines. It is, in fact, remarkable how consistent results from comparatively rough methods have proved in various districts.

In the first fenced area the scarcity of fly was such that decrease in density with progress of the operations could not be registered. It was merely a question of complete disappearance.

In the second fenced area decrease is indicated on broad lines by the following figures, based on fortnightly collections in certain selected localities:—

Average male density, 1927, (August-December)	34.4
Average male density, 1928 (June-December)	24.0
(Hunting commenced in July, 1928.)	
Average male density, 1929 (July-December)	5.8
Average male density, 1930 (July-December)	1.5

The figures from 1927 to 1929 refer to exactly the same localities, but the figures for 1930 include other localities, close to the northernmost fence, where the fly was known to be particularly abundant in previous years and still persisted in greatly reduced numbers.

Special inspection covering the whole year in 1931 and part of 1932 show continued diminution of fly. The returns for this period are numerous and mostly negative. They would be difficult to analyse to a definite figure comparable

with the above, but there is no doubt that this figure would not amount to more than a small decimal point.

The position in 1932 is shown on Map II., which, compared with Map I., gives a clear indication of the diminution and retrogression of the fly in the area of operations. It may be stated that total elimination of tsetse fly from the zone immediately adjacent to the northernmost fence is probably impossible without extending the operations further north. This zone seems to be populated by flies which range over the fence from the undisturbed country beyond.

It is interesting to note that figures collected in a small zone extending 4 miles *north* of the northernmost fence and adjacent to the more densely infected area south of that fence show a progressive diminution from the year 1929. Comparable figures for two localities on the Wendi and Rukute Rivers respectively each four miles north of the fence gave an average male density of 32.4 for 1929 and 16.0 for 1930, but these only cover the period from late September to early November, and the number of collections is insufficient to give a fair comparison with the fenced area. The average male density for the whole year in 1930, including a traverse not utilised in 1929, was 20.7. In 1931 the figure comparable with 1930 is still lower, the average male density being 10.1. Collections in 1932 seem to indicate further diminution. During 1931 and 1932 it was also ascertained that the density of the fly decreases from the four-mile points southward towards the fence.

This diminution in an undisturbed area is probably partly attributable to the fence, which bars access to the favoured grazing grounds around the Chipingabadza River, a small affluent of the Rukute River, within the fenced area and not far (about 2 miles) from the northernmost fence. The Wendi and Rukute Rivers flow through broken country beyond the fence, and this affords poor grazing. The game which formerly frequented this area and grazed on the Chipingabadza has now been either destroyed or has largely left the locality. The reports of the inspector have latterly indicated great scarcity of game on this traverse, whereas the earlier reports indicated that game, including rhinoceros,

was *comparatively plentiful*. The diminution may also be partly due to the factors dealt with under "Overflow of Fly Across Game Fences" (q.v.).

In the adjacent Sipolilo area it has not been possible to follow events quite so closely, but, when the fence was being erected in 1928, fly was plentiful along the fence line from the Hunyani River to about half the distance to the Impinge River. Recent inspections (1931) have failed to reveal fly in this region except close to the Mvume-Hunyani confluence. It is to be noted that the native hunters under the direction of the Assistant Native Commissioner have been operating both north and south of the fence in this sub-district.

Game.—It is not possible to furnish comparative figures concerning the reduction of game in the fenced areas, for the reason that the zone of operations has been extended from time to time and the number of hunters has varied. At the commencement of the operations in the first fenced zone game was comparatively abundant, the hunters securing 896 head in 1926, of which 554 head consisted of animals the size of bushbuck and over. In 1927, in the same area, the total was reduced to rather over half, of which only one-third were of the larger size. At present the whole of the fenced area is practically free from the larger species, although an odd animal occasionally breaks in or invades the area from west of the Angwa River.

It may be noted that the presence of considerable numbers of *baboons* has not prevented the disappearance of the fly. It is known that tsetse will attempt to feed on these animals and that flies are frequently picked up in the wake of a stampeding troop. Baboons, however, do not seem to constitute a source of blood on which the flies can feed economically. They are irritable under attack, and it is possible that they and also monkeys catch and destroy a considerable proportion of the flies which attempt to feed upon them, in which case they would need to be regarded as allies rather than otherwise.

Man.—It has often been contended, and not only by laymen, that destruction of the game in any area would lead to the tsetse feeding more and more upon man. It can only

be said that in these and previous operations there has been no indication at all of the fly concentrating on man, and the presence of a considerable native population has not prevented the retrogression of the fly in the area under review.

Tsetse flies frequently obtain a meal from man, but like baboons and monkeys, man is an irritable host, and, of course, kills the flies whenever he can. In general, in common with some other investigators, the writer is inclined to the opinion that *morsitans* cannot feed economically on man, and the probability appears to be that man, baboons and monkeys can all be classed together in this respect.

Trypanosomiasis.—The final test of the success of any operations against tsetse fly must lie in ability to keep cattle in the area it is desired to protect. This is a very exacting test in Southern Rhodesia owing to the extreme susceptibility of European-owned cattle. Intensive search occupying months of continuous work has to date invariably failed to reveal the presence of tsetse over the whole area in which cattle are liable to contract trypanosomiasis. There appears to be no doubt that odd flies range from the definitely infested area for very considerable distances. In addition they may, of course, be carried by travelling man or vehicle or game. Traffic can, however, be controlled to a large extent.

The further the distance from the definite fly area, the less in general is the chance of wandering flies coming into contact with cattle, but there are indications of favoured avenues along which flies wander, so that a farm nearer the fly belt may escape whilst one further off is affected.

The aim of operations of the type under review is to put a sufficient distance between the occupied country and the definite fly area to place the farms beyond the reach of ranging flies. Incidentally, of course, potential carriers of fly in the shape of game animals are largely eliminated and vehicular traffic is brought under control. Effective control of pedestrian traffic is, however, very difficult, if not impracticable.

During the year 1926 the position on the farms remained very serious, in fact the disease was more widespread than previously. The following farms sustained more or less

serious losses, namely:—(1) Between Hunyani and Angwa Rivers: Gudubu, Robbsdale, Riversdale, Mungamwa (?), Two Tree Hill (?), Mcheringe. (2) East of the Hunyani: Chiwe, Silater, Mafoota, Mafoota Extension, Chisanga, Allangrange, Msitkwe River Ranch. Gudubu and Msitkwe River Ranch were evacuated during that year. Native cattle between the Hunyani Range and the Hunyani River south of the fenced zone were also seriously affected. It should be pointed out that the above information may not be complete. When not suspected, losses from this disease are liable to be attributed to poverty.

The year 1927 showed a considerable improvement, especially east of the Hunyani River, where all the farms were free from the disease except the most northerly and nearest to the fly area, namely, Chiwe Estate. Between the Angwa and Hunyani four farms were affected, namely, Robbsdale, Riversdale, Whindale and Mcheringe. The last-named was evacuated during that year.

The improvement was more than maintained in 1928, when all the farms east of the Hunyani remained free, except Chiwe, and even on this farm five spans of oxen were worked and only three cases recorded, of which two were probably relapses. Between the Angwa and Hunyani only one farm was seriously affected, namely, Riversdale. Intensive inspection carried out on and around this farm in 1927 and 1928 failed to reveal fly anywhere in the vicinity.

In 1929 the position east of the Hunyani River remained much as before, but an outbreak of the disease occurred on Chiwe. Between the Hunyani and Angwa Rivers two farms, namely, Robbsdale and Riversdale, sustained losses. Two spans of oxen were worked on Mcheringe without loss. These animals were injected with an antimony preparation as a prophylactic. Unfortunately a farm not known to have been affected previously and considerably removed from the fly area sustained an outbreak, and two tsetse were actually caught on the farm. Heavy losses, attributed to poverty, are, however, stated to have occurred on this farm previously and were not reported. This farm, it may be noted, is on the main road and traffic route from the fly area. It has since been fenced and no further cases have been reported.

In 1930 the danger of sporadic incursions was again demonstrated by reappearance of the disease on two farms on the east side of the Hunyani River, namely, Mafoota and Allangrange, which had been free since 1926. On Mafoota three head died, and the number of cases on Allangrange, which is the further from the fly area, was estimated at 23. The outbreak may have been due to fly transported by motor vehicles. The cases all occurred during the earlier part of the year, ceasing after August, and none have occurred since. Twelve cases were reported on Chiwe Estate during that year.

Between the Hunyani and Angwa Rivers in 1930 cases occurred on three farms, but the losses were small. Tsetse flies were taken on Robbsdale by the owners during this year, but a thorough search by an inspector and ten natives failed to reveal any definite infestation.

It is to be noted that in 1930 and the early part of 1931 certain mining activity was in progress close to Robbsdale and the southern game fence, one property being within the fenced area and one without. This entailed car journeys to the north centring on the mine. It also concentrated native traffic to this vicinity. The catching of flies on Robbsdale is tentatively attributed to this traffic.

Two spans of oxen again worked on Mcheringe farm during 1930 and no losses were sustained.

In 1931 the only cases recorded occurred on Robbsdale, but the losses were comparatively light.

During the present year the disease has reappeared on Riversdale, which had been free since May, 1930, and several head have died. No other farms have been affected this year.

In addition, there is no doubt that cattle have been ranging freely over land adjacent to the southern fence for some considerable time, and no cases are known to have occurred. This region was carefully avoided a few years ago, the aim being to keep cattle as far south as possible.

An evacuated farm in this region is now being cautiously restocked with cattle.

It may be added that early in the operations native cattle south of the southern fence between the Hunyani

Range and the Hunyani River were evacuated on account of severe losses from trypanosomiasis. With the general improvement in this position after 1928, cattle were permitted to return to this locality, a process which took place gradually. No cases of trypanosomiasis are known to have occurred amongst these cattle since their return. Cattle have not yet been allowed to return to the area between the fences.

It will be seen, therefore, that whilst there still remains some risk of infection the outbreaks have become isolated and sporadic, whereas at the commencement of the operations the cattle were dying freely all round the salient of the advancing fly.

During the earlier part of the operations more farms would certainly have been evacuated if the Government had not come to the help of the farmers with cattle and financial assistance. Had a measure of relief from the incidence of the disease not occurred between 1926 and 1927, more or less general evacuation must have occurred over the whole "front."

The experience in this Colony during the past quarter of a century has been that the tendency of the fly is steadily to encroach towards the limits of its distribution in the past century. No retrogression of the pest has been recorded anywhere except where direct efforts have been made to drive it back. The Umboe Flats, now in agricultural occupation, are known to have been heavily infested with tsetse during the past century, and also the valley of the Hunyani River in the same region. It may be stated with confidence that had the advance of tsetse not been stayed by the operations, the fly would have gradually enforced the evacuation of farms over the whole of the Umboe Flats and much additional country.

The farmers in the district have not been slow to recognise the danger with which they have been confronted, and on more than one occasion, through their associations, have expressed their appreciation of the Government's action.

Sipolilo Sub-District.—The operations in this district, according to reports from the Assistant Native Commissioner, have had an equally satisfactory result. In 1926, 141 head

of cattle are reported to have died from the disease. In 1927 the number of cases is given as 29. In 1928 the Assistant Native Commissioner summed up the position as follows:—

1. There were no deaths due to fly.
2. The Sipolilo Reserve is free of fly.
3. Fly are decreasing between Impinge and Hunyani Rivers, south of Mt. Barawari.
4. Game is diminishing.

In 1929 the report was also that no deaths had occurred and that both game and fly were still dimiuishing. It may be noted that whilst cattle have been withdrawn from the most forward positions, they have been present throughout at certain kraals which sustained heavy losses from 1924 to 1926.

Reports for 1930 and 1931 were similarly favourable, although in 1931 one headman lost 14 head through allowing his cattle to stray into the fly area.

The menace of fly encroachment has been removed from this sub-district at comparatively small cost.

Fly Incursions.—The chief trouble connected with tsetse fly still causing anxiety to the farmers in this district is the danger of occasional incursions leading to infection of their highly susceptible cattle. Other animals are rarely infected in areas subject to such incursions. These incursions are sporadic and may apparently take any direction, although certain routes seem to be rather favoured.

It is natural when a fresh farm has suffered an outbreak to deduce that the fly has spread to a new locality and to infer, therefore, that the operations are not achieving their object. Experience shows, however, that these sporadic outbreaks are to be expected within a certain, or rather *uncertain,* distance of a definite fly area, and the fact that they do not constitute actual spread of fly to a new locality is generally demonstrated by their temporary character.

The distance from the definite fly area at which outbreaks of trypanosomiasis may occur is remarkable. An outbreak occurred some years ago (1924) amongst pigs in the Mazoe district at least 60 miles from the fly area. Similarly, in 1927 an outbreak occurred amongst cattle in the

Lupane Valley in the Shangani Native Reserve 30 or more miles from the fly area. In the Lomagundi district farms 20 miles from tangible fly have sustained outbreaks, and the position in the Hartley district is similar. Such outbreaks may be limited to one or two animals, but it is strongly suspected that under certain conditions the disease is spread amongst associated animals by means other than tsetse fly "bites." A considerable number of cases may occur in this way.

It has been usual to look to traffic or game movements for an explanation of such sporadic outbreaks, but traffic at least does not explain the position satisfactorily in many instances. The first occupied farm passed by the main road from the fly area in the Lomagundi (Umboe) area is Richmond, and this farm has never had a definite case of the disease.

The most difficult outbreaks to explain are those on Riversdale. This farm and the vicinity have been frequently and intensively searched for fly since 1926 and no tsetse has been found either on the farm or anywhere in the vicinity. The farm has, however, been affected by trypanosomiasis with two fairly long breaks since that year, and the losses have been considerable. The breaks occurred (1) between April, 1927, and August, 1928—17 months; (2) between May, 1930, and February, 1932—21 months. It is curious that the neighbouring farms, Robbsdale and Riversdale, have tended latterly to alternate in sustaining outbreaks. They are both situated close to a definite range of hills running north and south, and this may be a favoured route for fly incursions.

The situation within the fenced zone is now so satisfactory that it is permissible to hope that incursions will become still rarer, if they do not cease altogether. Riversdale farm is now about 20 miles from the edge of the definite fly area, and still further from any spot where fly now occurs in measurable density.

Overflow of Fly Across Game Fences.—The experience with operations against game conducted in this Colony is that the fly gradually recedes from its extreme limits towards the main fly area, it being understood, of course, that the

operations straddle the limits of the fly at the commencement. Where hunting towards the main fly area is rigidly limited by a game fence, however, it has not so far been found possible to effect elimination of fly as far as the fence, notwithstanding the fact that game conditions near the fence are no more favourable to the fly than elsewhere within the zone of operations. It is, in fact, apparent that the fly overflows for a considerable distance from the undisturbed country beyond, irrespective of game conditions in the country penetrated. Conditions are such in many places that the phenomenon *cannot be attributed to flies being carried* either by game, man or vehicle. In other words, they appear to range spontaneously on the wing.

Opportunity of demonstrating this movement by marking large numbers of flies has been lacking, but it seems reasonably clear that it occurs, as (1) the fly only persists in the strips adjacent to the further fences, (2) the highest *densities within the fenced zone are found* in country adjacent to the highest densities beyond the fence, and (3) density of fly gradually diminishes from the fence towards the centre of the fenced zone.

This overflow is continuous and not sporadic, the areas affected maintaining a more or less constant, but in reality gradually diminishing, density. This fact seems to throw some light on fly movements. The distance to which overflow or free ranging occurs may be at least three or four miles, dependent upon the density across the fence, and in lesser number the fly may penetrate still further until the zone of sporadic incursion, penetrated only by occasional flies and lacking definite density, is reached.

Another point worth recording is that the tendency appears to be for the fly gradually to diminish on *both* sides of the limiting game fence, a phenomenon which may be in some degree due to the fact that the original density on the undisturbed side was partially maintained by circulation of flies from the side now rendered unproductive by removal of the food supply. In other words, the undisturbed side of the fence does not now receive accessions of flies, produced across the fence, to compensate for those lost by movement in the opposite direction.

The deduction from the foregoing is that in order to free an area of tsetse fly by operations against game, it is necessary to operate beyond it, as well as within it, presuming, of course, that an effective barrier to fly movements cannot be interposed.

Given such a barrier, which is at present apparently impracticable in the *morsitans* areas in this Colony, it appears quite possible that in a limited area elimination of tsetse might be brought about by intensive operations against game very much more quickly than has been the case up to the present. It is judged, in fact, that results are greatly delayed by constant invasion by flies generated beyond the zone of operations.

Consolidation of Position.—Results achieved by driving back the game on the edge of an extensive fly area are generally recognised as being of a potentially temporary nature. This was well demonstrated in the Gwaai-Shangani region where the fly, driven back by operations between 1919 and 1922, obtained sufficient new momentum by 1927 to affect cattle again along the Gwaai River and since then to infest a considerably greater area. History would no doubt repeat itself if the operations were suspended in the Lomagundi (Umboe) area.

This has been realised from the first, but the alternative of allowing the occupied area to be overrun by the fly was unthinkable, and, therefore, the only practicable measure was adopted.

It has been thought that whilst the fly was being held back by temporary measures, research proceeding in various parts of Africa might reveal some better and more permanent method of dealing with the menace or some method of giving permanency to results obtained by operations against game. Unfortunately we are still without any sufficiently economic method of creating a permanent barrier against the fly's advance in the class of country involved.

Possibly the temporary nature of results from present methods has been rather over-stressed. Indefinite expenditure is contemplated by civilised countries generally in connection with maintaining a guard against various evils and permanent officials are maintained with this object. No

artificially created barrier against tsetse fly can be conceived which would not involve indefinite expenditure in maintenance. *Total elimination of fly in this and adjoining countries* alone could give finality to results.

It is to be noted that in the Sipolilo sub-district the *cost of checking and driving back the fly has been limited* to the supply of rifles and ammunition to some 30 odd natives and that there is every prospect of the position being maintained indefinitely by this procedure. The same procedure has been adopted in other districts with a view to preventing further spread of the fly rather than reclaiming ground from it. It has proved considerably easier to check spread of tsetse than to cause it to evacuate any appreciable area of country. In areas where the fly is actually infecting cattle on the farms and threatening to dislodge settlement, comparatively costly operations with the object of driving back the pest far enough to place the farmers beyond the range of fly incursions are unavoidable, but once this object has been attained, the holding back of the fly should, in certain districts at least, cost very much less.

The feasibility of holding back the fly through the simple procedure of arming native hunters depends, of course, upon the density of native population in the district concerned. In some districts unfortunately there is little or no native population, and the country is unsuited to supporting more than a very few widely scattered kraals. These districts constitute a difficult problem.

In the Sipolilo sub-district the position is unusually favourable. There are ample natives, and the Assistant Native Commissioner is situated in the area of operations and can control the natives effectively.

A move was made last year in the direction of reducing expenditure in the area under review without sacrificing the results obtained. This took the form of reducing the number of paid hunters to 12 and arming a number of other unpaid natives, all being under control of the resident ranger. This arrangement appears to have worked satisfactorily to date.

Other Districts.—The operations in Lomagundi (Umboe and Sipolilo sections) have been longer in prosecution than

those elsewhere. In some other districts the position is not as yet so satisfactory.

The next oldest operations are in the Hartley district, and this has been found a considerably more stubborn area to deal with than Lomagundi (Umboe). This fact is attributable to several factors. In the first place the fly was much denser close up to the occupied country than in Lomagundi. Secondly, the forest is more uniform, affording more cover to game; and thirdly, the area is poorly supplied with permanent water, a fact which hampers the hunters. Game will travel far to water, but the radius of effective hunting from a permanent water supply is limited.

None the less, the fly is gradually receding westward in the fenced area in the Hartley district, and is now only to be found in any considerable density at certain spots close to the western fence. With a view to bringing about further retrogression as speedily as possible, extra hunters have been engaged and a further ten mile width of country brought within the scope of the operations. The full result of this is not likely to be apparent for several years, and the position may appear worse rather than better in the meantime.

In the Lomagundi S.W. area the operations were started in 1930 as soon as the first cases of disease appeared on the farms, and further development of the trouble appears to have been prevented. The position in this area is satisfactory at present.

In other districts the operations have been inaugurated too recently for definite results to be apparent.

General.—The exact effect on the fly of radical reduction of game is somewhat uncertain. Investigations carried out by Mr. J. K. Chorley, of the Entomological Branch, in the second fenced area in the Lomagundi (Umboe) district in the years 1927, 1928 and 1929 revealed little in this connection beyond the facts that the density of the fly was rapidly declining, that the remaining flies were hungry and that some change was apparent in the percentage infestation of the flies with the *different species of trypanosomes*, the last suggesting a change in the animals from which the flies were obtaining blood.

The results of investigation in different parts of Africa to date indicate that the tsetse is guided to its food supply mainly through the sense of vision. Consequently the larger animals constitute the most readily detected source of blood, although, in short-grassed country, such animals as warthog are very conspicuous and are much preyed upon by the fly.

The effect of intensive hunting is probably twofold. In the first place, the food supply is reduced to a minimum, and in the second place, the habits of the animals are changed *in a way which tends to break up their association with the fly*. The animals become timid and retire to the hills or other retreats away from the fly during the day, coming down to the lower levels, which are frequented by the fly, during the night, when the flies are generally inactive.

It is known that the fly needs comparatively frequent meals to maintain both life and breeding activity. Under the very artificial conditions of confinement, they need a feed every two or three days, but recent work in Tanganyika has suggested that in nature they feed normally about once every five days.

Under undisturbed conditions in the presence of an abundant food supply the fly, of course, may increase or at least maintain its numbers. Under conditions which lead to irregular and only occasional meals it is evident that the fly tends to diminish. It is thought that this is due to decline in the breeding rate and, no doubt, increase in the death rate. There are no indications that the fly as a whole migrates from such disturbed areas, although there are certain indications that it tends to range further afield for a period, possibly in search of food.

It has been suggested that, whilst reduction of game may be expected to result in diminution of fly, actual extermination is not to be expected from this measure. The argument appears to the writer to be theoretically unsound and has not been borne out in practice.

The vital factor is not the quantity of blood present in any given area. One buck might afford sustenance to quite a large number of flies. The vital factor is the frequence of *opportunity of feeding. In this respect, if the game* and fly are largely disassociated, due to change in habit and scarcity

of the former, a few fly have no more opportunities of obtaining regular meals than a large number. Once conditions are such that the fly is decreasing for lack of regular sustenance, maintenance of these conditions should theoretically result in the decrease continuing until the fly dies out altogether.

It is necessary to realise that although the tsetse flies will follow moving animals for limited distances in the day time, they do not maintain indefinite contact with herds of game and follow them in their wanderings. If they did there could apparently be no such phenomenon as a definite fly belt. The flies are in general dependent upon finding a fresh source of food each time they need to feed, and are also apparently largely dependent upon animals penetrating into their particular habitat.

The apparently complete disappearance of resident flies from the whole of the first fenced zone and a large portion of the second fenced zone in the Lomagundi (Umboe) area indicates that elimination is not only possible through extensive hunting of game but that it is the natural sequence of events if the operations are sufficiently maintained.

It may be added that, whilst the question is no doubt debatable, the writer is not convinced that scattering of game from a fly-infested locality by hunting has more than a very temporary, if any appreciable, effect in spreading fly. Most investigators are also of opinion that the fly has a "homing instinct" and tends to return to the "fly belt" if carried some miles out of it by game or other agency. This also seems to be a necessary corollary to the existence of definite fly areas, but the question requires further investigation.

Finally, it is necessary to state that the view that tsetse can support itself upon food obtained from *vegetable* sources is altogether unsupported by the extensive research carried out by official investigators in various parts of Africa.

It must not be inferred that operations against game are regarded as a fully satisfactory or desirable means of controlling tsetse fly. The limitations and drawbacks, not to mention general distastefulness of this method, are fully realised. The operations have been undertaken simply in default of any better method of saving the Colony from being

overrun by tsetse, a pest which, as far as agricultural and pastoral industry is concerned, at present carries all before it.

It unfortunately has to be admitted that the prospect of discovering feasible alternative methods of controlling tsetse (*Glossina morsitans*) over the wide areas involved in this Colony seems decidedly remote, at least until both population and revenue have increased considerably above the present figures. Certain lines of research are, however, being prosecuted with this end in view, and the Entomological Branch is in touch with work proceeding in other parts of Africa.

Summary of Chief Points.—1. Operations against game were commenced in the Lomagundi (Umboe) area at the end of 1925 in a fenced zone approximately ten miles wide adjacent to the occupied area, where heavy losses of cattle from trypanosomiasis were being sustained.

2. The operations were extended in July, 1928, to a new fenced zone about ten miles wide adjacent to the first zone on its northern side.

3. The advance of the fly ceased with the commencement of the operations.

4. The fly showed definite signs of retrogression from 1927 onwards, and at the present day the limit of the definitely infested area has receded to a minimum distance of 15 miles and a maximum distance of over 20 miles, tangible infestation being now confined to a narrow strip adjacent to the northernmost fence, where its continued presence is almost certainly due to overflow from outside. The area reclaimed from infestation is roughly 500 square miles in extent.

5. Trypanosomiasis in the occupied area has greatly decreased, being now confined to occasional outbreaks on isolated farms. Only one farm has been affected during the present year, and only one—a different farm—last year.

6. Evacuation of farms has ceased, and the present tendency is for new land to be taken up rather than the reverse. Native cattle have been returned without loss to certain areas whence they had been evacuated on account of

trypanosomiasis. One previously evacuated farm has been worked for two years without loss and another is being re-occupied cautiously at the present time.

7. The cost of the operations has now been considerably reduced without apparent loss of efficiency.

SALES.

AGRICULTURAL EXPERIMENT STATION, SALISBURY.

Spineless Cactus Slabs (blades) Algerian variety, per 100 slabs, 7/6 Salisbury, or 12/6 delivered free by rail to purchaser's nearest station or siding in Southern Rhodesia. For amounts of 500 slabs or more a reduction of 2/6 per 100 will be made.

Stocks are limited and delivery cannot be undertaken after 15th November.

Kudzu Vine Crowns, per 100 crowns, 15/-, Salisbury, or 25 crowns, 7/6; 50 crowns, 15/- and 100 crowns, 22/6, delivered free to purchaser's nearest station or siding in Southern Rhodesia. Delivery during September and October for irrigated land, and in January for dry land. Owing to pressure of other operations, it is not possible to deliver Kudzu crowns during November and December.

Woolley Finger Grass: 10s. per bag of roots, delivered on rail nearest station or siding; supplies limited. Available January and February.

The prices quoted above do not include charges for road motor transport. Cheques should be made payable to the Department of Agriculture, and preliminary enquiries and subsequent orders should be addressed to the Chief, Division of Plant Industry, Department of Agriculture, Salisbury.

NOTES ON AFRICAN ALOES.

By H. Basil Christian, Ewanrigg, Arcturus.

PART III.

Aloe Excelsa.—This is the only tall-stemmed aloe so far recorded in Southern Rhodesia and is one of the most striking looking aloes we have in this Colony. It is widely distributed in granite country and occurs in scattered colonies right across Southern Rhodesia. As often as not it is found growing in the shade of trees. It is one of the tallest of the arborescent aloes, growing to a height of up to 30 feet. The plant illustrated measured 26 feet to the bottom of the rosette of leaves, but unfortunately was broken off 11 feet from the top when being lowered to the ground for transportation to its present site.

The leaves grow to a length of up to 6 feet, with spines on the margins and underside, but these latter vary considerably in numbers. One finds plants growing side by side, the one with hardly any whilst the other is copiously studded with spines on the under surface.

The inflorescence is a panicle, one or more from the same rosette of leaves. The racemes are densely flowered up to 12 inches long, with the flowers deflexed, usually with from 10 to 15 racemes from the same peduncle. When the flowers open the stamens and style project for a considerable distance beyond the end of the perianth.

The colour varies from a light orange to blood crimson.

This aloe flowers from the end of July into September.

Aloe Marlothii, Lobatsi Variety.—*Aloe Marlothii* occurs in Bechuanaland, the Transvaal and Natal and varies considerably in habit of growth in the three separate localities. It is an arborescent aloe growing to a height of from 12 feet to 15 feet.

A. excelsa.

A. Marlothii (Lobatsi variety).

A. Marlothii (Barberton variety).

The Lobatsi Bechuanaland variety has pale, glaucous leaves up to 4 feet long, which are concave-convex in cross-section and have prickles on the margins and on both upper and lower surfaces.

The primary branches of the inflorescence are horizontal. The flowers are more or less secund, or turned to one side, and not arranged to form a cylindrical raceme.

The flowers are light yellow in colour and when open the stamens and style project for some distance beyond the end of the perianth.

This aloe flowers with me in August.

Aloe Marlothii, Barberton Variety.—This variety of *Aloe Marlothii* differs from the Lobatsi variety in that the leaves are not so strikingly pale glaucous in colour, having a decidedly greener tinge, and are not so copiously studded with prickles on the upper and lower surfaces.

It is an arborescent aloe and the primary branches of the inflorescence are horizontal and the flowers more or less secund. The young flower buds are yellow shading to green below and red above—later on as the flowers develop and open out becoming yellow below and red towards the apex. The stamens and style project for a considerable distance beyond the end of the perianth.

This aloe flowers under Rhodesian conditions in July.

EXPORT OF GRADED GROUND NUTS.

By H. G. Mundy, Dip.Agric. (Wye), F.L.S.,
Chief, Division of Plant Industry.

In terms of Article 5 of the Ottawa Agreement between the Imperial Government and the Colony of Southern Rhodesia, His Majesty's Government in the United Kingdom undertakes that the general *ad valorem* duty of 10 per cent. imposed by section 1 of the "Import Duties Act, 1932," on

ground nuts from sources outside the Empire, shall not be reduced except with the consent of the Government of Southern Rhodesia.

This pronouncement may well prove of very considerable importance to Southern Rhodesia Constant endeavour has been made to establish the ground nut as a major exportable product of the Colony since July, 1914, when, at the request of the farming community supported by the Administration, the British South Africa Company *in its commercial capacity*, opened the first local oil expressing works—the Salisbury Oil Factory. Rhodesian soil and climatic conditions are eminently suitable for the growing of ground nuts, and it was hoped that the provision of a local oil factory would stimulate production and enable an export industry in nuts and their by-products to be developed.

The many difficulties encountered during the intervening years are familiar memories to those who have been closely associated with the business. Viewed as a whole, the industry —*on the production side at least—has made little material* headway, and the annual output of nuts by European farmers has remained for some years at a figure of about 50,000 to 60,000 bags, to which, however, native production adds a not inconsiderable quota of nuts of somewhat inferior quality, suitable, however, for oil-crushing purposes.

Several enterprising individuals, together with the Farmers' Co-operative Society, Ltd., Salisbury, acting on behalf of its members—and more recently the Rhodesian Milling and Manufacturing Company, Ltd., Salisbury, have praiseworthily continued to exploit to a limited extent the overseas market for high grade nuts in the shell, and generally these exports have met with satisfactory prices and marked appreciation in Great Britain. For the trade in question, choice nuts in a clean, unblemished shell are required, and material progress has been made in devising practical methods of washing and scouring or bleaching to the required degree, crops of which the shells through being grown on the red clay loams of the Colony, are of an undesirable colour. Simultaneously experience has been acquired of grading the nuts in accordance with market requirements and knowledge has been gained of the requisite field methods necessary to ensure heavy yields per acre.

Foreign competition in United Kingdom markets for graded nuts in the shell, and for graded kernels has been encountered in the past from China and Java, but the 10 per cent. preference to be accorded to Empire grown nuts, aided in certain cases by the exchange should now, it would appear, afford Rhodesia the opportunity of establishing herself as a regular supplier of these commodities to the Home market. Certain information is still required in respect to the type of nut likely to find most favour, and in regard to the specific requirements of certain sections of the trade. It is known that the most commonly grown variety, locally called "Spanish Bunch," in the form of graded nuts containing three to four kernels in each shell has met with an excellent reception, but it is not yet definitely established whether the Colony should specialise in this type or some other. It may be that other kinds are particularly suitable for certain branches of trade.

A definite overseas interest in the purchase of Rhodesian nuts has been apparent for some time and in the hope of benefits to be derived from the Ottawa Conference, the Division of Plant Industry has instituted enquiries through the Imperial Institute, London, and the High Commissioner's Office, upon points on which further and more precise information seemed desirable. Though not yet available, it is expected that the resultant reports should come to hand in time to permit of publication in the next issue of the *Journal*.

Meanwhile, however, it is known that "Spanish Bunch" nuts properly graded do meet a definite demand. Needing, as we do, so urgently, a wider range of exportable products, it would be an infinite pity if these possibilities were not taken the fullest advantage of in the immediate future. In order to do so a sufficient acreage must be planted to ground nuts during the coming season to enable export on a reasonably large scale to be carried on. Small, intermittent shipments will not attain the object. Export should be regularly maintained between the months of August and March, at a rate of at least some 500 to 1,000 bags of graded nuts a month.

The crop must not be treated—as so often it is—as one of minor importance in respect to choice of soil on which it is to be grown and subsequent field operations. Given the

best treatment, yields of 15 bags (1,125 lbs.) per acre and up to half as much again, can be secured over the greater part of the settled area of the Colony. Heavy acre yields are not, however, alone sufficient; when selling or exporting red shelled and white shelled nuts must be kept separate and the utmost care must be taken to free the sacks of nuts from soil, small stones, cracked and damaged shells and similar impurities, and finally to grade and if necessary wash or bleach the product in accordance with market requirements. (Grading by Government officials may later prove desirable.)

Some difference of opinion appears to exist in regard to the desirability of scouring or bleaching the shells. One British firm interested in the business considers shells of a "golden" colour the more popular. Any discolouraton of the shells due to adhering soil or other causes, is definitely injurious to sales, but it would seem that the best demand may be expected from clean, unblemished shells which retain their natural bloom.

In the initial stages of establishing a regular export the producer, apart from the hope of eventually securing better prices, should be satisfied if, on account of their high quality, he can sell his nuts more readily than his Empire competitors.

Yields of Graded Nuts and Prices.—It has been variously estimated that the yield of graded nuts containing three to four kernels in a shell should normally average some 35 to 45 per cent. Given careful attention to the crop in all phases it is probable that this percentage can be improved upon. Prices for nuts—three in a shell—have recently ruled at £30 per long ton and £35 per ton for four-kernelled nuts. The market has later weakened, but somewhere around £25 to £30 per ton should usually be obtainable for the best grades. Costs of export amount to about 6s. to 6s. 6d. per bag of 75 lbs. Thus on a crop of 1,500 lbs. per acre, 40 per cent. of which will grade into "threes and fours," selling overseas at £27 10s. per long ton, the return should be somewhat as under:—

	£	s.	d.
600 lbs. at £27 10s. per long ton, say	£7	7	4
900 lbs. of inferior nuts at, say, 4s. per bag on farm	2	8	0
Total return per acre	£9	15	4

Transportation charges to England may be taken at the higher figure of 6s. 6d. per bag, and on the eight bags of graded nuts exported, the cost would be £2 12s. 0d.

Second-hand grain bags can be used, and putting these at 6d. each, a figure of 10s. will be expended on bags. Washing and scouring costs about 1s. per bag or 8s. on the portion of the crop exported. Thus a figure of about £6 5s. 0d. per acre would remain to cover cost of production, separation into grades having three to four kernels to the shell and grower's profit.

This return compares well with that obtainable from any other Rhodesian crop, barring tobacco, and it therefore appears that farmers interested in ground nut growing should now make a concerted effort to capture a portion of the United Kingdom trade in graded nuts in the shell and possibly, too, in graded kernels.

Extract from the *Rhodesia Herald* of the 20th October, 1932, in which the speech of the Treasurer, the Hon. P. D. L. Fynn, on the inter-Empire agreements entered into at the Ottawa Conference, was reported:—

> "An important item in the Canadian agreement was pea nuts (monkey nuts). Canada has agreed to extend to Rhodesia the same preference as that granted to Australia, namely, to allow our peanuts in free, as against a duty on foreign pea nuts of one cent per lb. There was a proviso in the Australian preference, however, that as soon as Australia satisfied Canada that she could supply all Canada's pea nut requirements they would place a duty of four cents per lb. on the foreign product. That meant 2d. a lb., and if Rhodesia could help Australia to supply Canada's needs it might prove a big thing.
>
> "This duty of one cent per lb. was equal to 3s. 1½d. per bag of unshelled pea nuts, or 5s. 7d. per bag of shelled pea nuts. From this they could calculate to what extent the duty would be increased if it were raised to four cents. Most of the foreign pea nuts came from China, and there was a prospect of Rhodesia being able to build up a big trade in this direction."

PASTURES AND THEIR MANAGEMENT.

NOTE.—*In the September number of "Farming in South Africa," there appeared an article by Dr. I. B. Pole-Evans, Chief, Division of Plant Industry of the Union, on "The Union as a Pastoral Country."*

In the first section of this article the natural grazing regions of the Union were discussed with special reference to altitude, rainfall, prevalence of frost, etc.

Although the conditions indicated might apply to some extent to different regions of this Colony, it is felt that sufficient information is not yet available to be able to indicate how nearly the areas possessing similar altitude and climatic conditions actually approach those indicated in the Union.

It is felt, however, that the information given in the remainder of the article will be of particular interest to Rhodesian farmers, and sections 2, 3 and 4 are therefore reprinted and will, we are sure, be appreciated by everyone interested in this important subject.—Ed.

PASTURE INVESTIGATIONS.

In the early days, the natural veld was sufficient for all the grazing required, as there was plenty of it and fewer animals to feed, but now, largely as a result of over-grazing and over-stocking, veld-burning, etc., veld deterioration has taken place, and it is found that the natural veld has to be supplemented, and therefore the question of "pastures" is an all-important one.

The original efforts to supplement the natural veld took the form of introducing exotic grasses and fodder crops. These to a large extent were unsuccessful, owing chiefly to the peculiar and exacting conditions of our soil and climate, and quite early it became clear that something more than this was demanded. Hence, as far back as 1913, this Division began a scrutiny of the individual pasture grasses of the

country, and quite early on in the investigations the fact was revealed that we had indigenous grasses of the very highest value, and such as were well adapted for the laying down of permanent pastures under the various conditions existing throughout the Union's grasslands.

Our Own Grasses.—The outcome of these investigations was that the stoloniferous species and strains of Finger grass (*Digitaria*) proved to be undoubtedly the most valuable pasture grasses in the country and work has consequently been concentrated on them.

Various species and strains of stoloniferous Finger grass are now known to occur throughout south, east and central Africa, and where they occur in any quantity they yield by far the most valuable grazing. On account of their creeping habit, high protein and mineral content and general palatability, they are eminently suitable for the laying down of permanent pastures. Many species and strains have been collected, mainly through the medium of the Botanical Survey, and tested out at Pretoria, and are now available for distribution and trial throughout the Union.

Other botanical investigations on grass have been carried out mainly by the Cedara School of Agriculture, by Professor Bews at the Natal University College, Pietermaritzburg, and by Professor Schönland, late of Rhodes University College, Grahamstown. Schönland, under the auspices of the Botanical Survey, carried out a valuable piece of work on the regeneration of depleted veld on the Amatola Range. He showed that by proper management it was possible to restore the veld to its original condition in a comparatively short space of time.

To Bews this country is indebted for much valuable information regarding the grasses and grasslands and their distribution in South Africa.

Staples, at Cedara, investigated the effects of grazing and burning the veld in the mistbelt where there is an average rainfall of 36 inches. His main finding was that burning annually during the winter encouraged the growth of "Rooigrass" (*Themeda*)—the dominant pasture grass throughout the Union—while heavy grazing destroyed it.

Mineral Content of Grass.—In 1905, Ingle, of the Division of Chemistry, Pretoria, was the first to draw attention to the fact that far too little consideration had been given to the diet of animals with respect to the mineral contents of their feed, and pointed out the possible relationship between this and disease in stock in South Africa.

Vipond, of the same Division, some nine years later, published analyses of a dozen hay grasses grown under South African conditions, and emphasised strongly the views previously put forward by Ingle.

Theiler and the staff of the Division of Veterinary Research, in 1924, gave an account of experiments carried out in Bechuanaland to demonstrate the importance of phosphorus in the nutrition of animals, especially when they were kept under the ordinary conditions of veld-grazing.

Since then, chemical investigations of pasturage have loomed large in agricultural literature. Chief amongst these has been the work of Henrici on the composition of the natural pasturage of Bechuanaland, the Transvaal High Veld, the Coast Belt (unpublished) and the pastures of various other parts.

Van Wyk, of the Division of Chemistry, co-operating with this Division, has made a detailed study of the relative food values of the different species and strains of *Digitaria* growing at the Pretoria Pasture Research Station.

The results of all these investigations go to show that South Africa possesses a wealth of highly nutritious fodder grasses which only need propagation and attention to yield valuable returns.

Following on these investigations is the recent work by Hall of the African Explosives Company on the application of fertilisers to grazing veld. Hall has shown conclusively that under varying conditions throughout the Union's grasslands the application of phosphorus and nitrogen not only increases the palatability of the veld, but also improves its general feeding quality considerably.

LAYING DOWN OF PASTURES AND THEIR MANAGEMENT.

Sufficient has been said above to indicate that, taken as a whole, the natural grazing veld of the Union is not ideal

for raising "beef." It has, however, been pointed out that there exist in many parts of the Union natural pastures of great value—although limited in extent—and many valuable indigenous species of grass. These are usually found in the more protected habitats, or in places where the soils are richer than usual. It is these grasses which have been sought out by the Division of Plant Industry, by means of the Botanical Survey, and are being made available for the improvement of natural grazing. They include perennial species of such genera as *Digitaria*, *Panicum*, *Urochloa*, *Dactyloctenium*, *Chloris*, *Pennisetum*, *Agrostis*, *Rottboellia* and many others. Most of these are stoloniferous species, and are eminently suitable, therefore, for propagation by stolons or runners. One of the principal difficulties encountered up to the present has been that of obtaining good viable seed of many of these grasses, and after considerable experience it has been found that it is both cheaper and more satisfactory to establish pastures through the medium of runners rather than by seed; especially has this been the case in seasons of uncertain rainfall.

In the laying down of pastures, too much emphasis cannot possibly be laid on the importance of selecting the best soils for the purpose. The soils should be thoroughly well prepared, and the ground freed as far as possible and practicable of all weeds.

Before pastures are laid down on any scale, it is well to establish nursery plots of the desired grass, so that expense is avoided in the purchase of "roots" and also to ensure that an adequate supply of planting material is on hand when conditions are favourable.

Planting can be done at any time during the wet season, but the best results are frequently obtained towards the end of the season, when the rains are more certain and the atmosphere is cooler.

Grazing should not take place until the new plants have thoroughly established themselves and made vigorous growth. Even then the grazing should be light, and no heavy grazing should take place until the grass sward is complete.

It is, of course, essential that all artificial pastures be carefully fenced and paddocked. Once the pastures are

firmly established, they should be grazed as uniformly as possible, avoiding both overgrazing and undergrazing. As soon as grazing is complete, the pasture should be rested until a new flush of growth appears, and then it should be resumed.

Overgrazing in the spring months should be avoided at all costs, and in no circumstances should old growth from a previous season's growth be allowed to remain over for the following season. Manuring or fertilising the pastures must *form the most important part of pasture management.* Heavy grazing can only be counterbalanced by heavy manuring. Fertilisers will not only improve the general palatability and feeding value of the pasture, but they (especially nitrogenous manures) will induce early growth of the pastures. Phosphatic and nitrogenous fertilisers are just as essential for pastures as for crops; in fact, the actual return from pastures is far greater.

Detailed information regarding the most suitable indigenous grasses for laying down to pasture for the different regions and areas can be had on application to the Division of Plant Industry.

RANCHING AND VELD MANAGEMENT.

The writer, after long observation, has been struck by the lack of intelligent interest the majority of farmers take in the veld which provides the all-essential pasturage. They are slow to detect the marked and rapid changes which invariably take place in ill-treated veld, and it is only when the veld has been ruined and the pasturage reduced to vanishing point, that the Department is called to their assistance. There are, however, some remarkable exceptions to this, but they are few and far between.

The problem of handling stock without serious injury to the veld is of the greatest economic importance, and requires the most careful study on the part of the farmer. It is probably the most complex of all his operations. He is dealing with two entirely different biological units, the grazing animal on the one hand and the living plant on the other. No hard and fast rules can be laid down in dealing with matters of this kind, but his personal experience of his local conditions will be his main stand-by in this respect.

The same fundamental principles apply to ranching and veld management as pertain to the management of pastures. Uniform grazing of the veld should be aimed at. This can only be obtained by a complete system of camping, and the smaller the camps, the more efficient will be the grazing. Changes in the veld, such as encroachment of weeds, the growth of thornbush, a change in grass composition and the occurrence of bare patches, should be immediately noted and the causes thereof sought. In other words, the influence of the grazing animal on the veld at different seasons of the year should be carefully studied. The average South African farmer is endowed with remarkable powers of observation, and these should be directed above all things to veld changes.

The provision of adequate watering places is one of the first essentials both in the establishment and management of a ranch. Without this, maltreatment of the veld will naturally occur. Every opportunity of conserving surface water, by making both temporary and permanent dams, should be seized upon. The important matter of veld erosion should also receive most careful consideration and prompt attention. The renovation of bare patches by the restoration of grass can in many cases be readily brought about by simple methods, such as the felling of thornbush for the protection of such areas. The encouragement of stoloniferous or creeping grass in this connection should also receive special attention, especially as South Africa is remarkably fortunate in the possession of a great number of valuable pasture grasses belonging to this class.

Rotation System of Grazing.—A definite rotation system of grazing should also be adopted, whereby each camp in turn is allowed to reach maturity each year before grazing is permitted. In the United States, an ingenious system, known as "Deferred Grazing," has been worked out and practised, with highly satisfactory results. There is no reason whatever why the same system should not be adopted in the Union, with perhaps suitable modifications. The system, as stated by Sampson,* is as follows:—

* Sampson, A. W., "Range and Pasture Management," page 74, 1923.

"The essential principles of the deferred grazing system are:—

(1) An overgrazed area, sufficiently large to supply the forage from the time of seed maturity until the end of the grazing season, is protected from stock until the seed crop has matured.

(2) Upon maturity of the seed crop, the forage is grazed closely during the first season, but not to the extent of injuring the seed plants.

(3) The same area is protected to about the same date in the second season and longer, if necessary, or until the new plants have been thoroughly established.

(4) When the area has been satisfactorily re-seeded, it is grazed early in the season, and a second area, of sufficient size to accommodate the stock from the time of ripening of the seed to the end of the grazing season, is protected until the forage has matured.

(5) Alternating the grazing after seed maturity from one area to another is continued, not only during the period required for the re-stocking of each selected area, but even after the deferred portions have been fully re-vegetated. This plan not only keeps the vegetation vigorous at all times, but results in the formation of an occasional seed crop."

Veld-burning.—This method of veld treatment will naturally bring into prominence the question of old grass or roughage. Every endeavour should be made to make stock remove the previous season's crop of grass before rotting or souring of the veld takes place. This should be done either by the use of a herd boy or by special paddocking. If it cannot be accomplished by these means, then resort must be made to burning. Burning of the veld, however, is certainly not recommended as a general ranch practice, but circumstances may arise where it becomes necessary to employ burning every third or fourth year, especially if surplus pasturage cannot be removed either by stock or by cutting for hay or ensilage. Much more use of the grass crop could

be made throughout the country if it were cut for hay and ensilage early in the summer than is at present done.

Thousands of tons of valuable feed are destroyed annually through deliberate burning of the veld. Had this, however, been removed when it was young and succulent, it would have furnished ample provision for winter and lean times. Important developments which are being made by science in the preservation of young succulent grass in the form of grass bricks would seem to offer great possibilities for the future of a great grass country like Southern Africa.

Summary and Conclusions.—The eastern half of the Union is essentially a grass country, which falls naturally into three regions:—A central temperate region—the High Veld—a pure grassland, which, on account of its high elevation, has a relatively short growing season. A surrounding tract of sub-tropical country—the Middle Veld or Bush Veld—of lower altitude and with a longer growing season. An eastern coastal and low-lying region of tropical character—the Low Veld.

The bulk of the natural pasturage forms fair grazing during summer, while good winter grazing is limited both in quantity and extent.

Many valuable indigenous grasses eminently suitable for the laying down of artificial pastures of high quality are found in these grasslands.

The natural occurrence of these grasses is restricted, as they grow mainly on the more fertile soils.

Fertile soils are essential for good pastures.

In laying down permanent pastures of these valuable grasses, the best soils must be chosen, and in addition these must be kept constantly fertilised to maintain the value of the pastures. Good pastures furnish the cheapest means of providing good beef.

It is a fact worthy of mention here that the natural grasslands of the Union are also the regions which produce the cattle-food concentrates.

Farmers have to alter their entire outlook with regard to grass and pastures. They have to look upon grass as the most valuable asset they possess. It must receive the first

consideration in the management of their farms and ranches. In such circumstancs only will the beef industry forge ahead.

The preservation and improvement of the natural pastures on which up to the present the entire stock of the country has been raised have received practically no attention whatsoever from the farmer, and it says much for the enormous properties of endurance possessed by these pastures that they are in existence at all—although dilapidated—when we consider how they have been treated with regard to overstocking, overgrazing and veld-burning.

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FARMING CALENDAR.

November.

BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development. This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in. If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms. Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the *trees are ready for lifting in the nurseries. All unthrifty trees could* with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

CROPS.

Take note when the first rains fall, and see what leaks there are, if any, in the farm buildings. Do not neglect to effect such repairs as are necessary. Early in the month see that the planters are in perfect order, and that they drop the different seeds to be planted evenly and at the right distance. Try them out on the farm road. Hasten the work of getting the lands for early sown crops into as good a condition for seeding as possible, so that the first and most favourable opportunity for planting may be seized. The young plants make more rapid growth in a good seed bed. Utilise exceptionally early rains for this purpose rather than for planting. The holes for check-row planting of maize can continue to be prepared until sufficient rain has fallen to allow of planting. Velvet beans and dolichos beans for seed or hay may be planted dry if the land is in good order. With favourable weather, planting of *maize, velvet and dolichos beans and cotton will commence about the* middle of the month, and will continue as the condition of the land and the rainfall permit. Main crop potatoes should be planted from now on to January. Dhal may be planted for seed or green manuring—if for seed, a frost free situation is necessary. Kaffir corn for seed may be planted this month. Green-manure crops requiring a long growing season should be planted. Destroy, by feeding or burning, early planted trap crop of maize or volunteer plants which have become infested with stalk-borer.

If weeds are beginning to show, keep the harrows going in front of the planters. If weeds are too advanced to be *killed* by drag harrows and too numerous to be dealt with by hand labour, use the disc harrow or lightly re-plough the land. If the tilth is good, do not be afraid to harrow the young maize. This will save much labour later on by destroying the weeds while they are small.

DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

ENTOMOLOGICAL.

Maize.—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure. If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

Tobacco.—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

Potato.—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

Kitchen Garden.—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

Deciduous Fruits.—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this Colony:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

FORESTRY.

Sowings of eucalypt (gum) seed should be made for late planting. If fresh seed of cedrela toona is available, sowings should be made. Keep the seed beds moist and free from weeds. The tap roots of early seedlings may be cut back in order to form hardy, stocky plants most suited for planting. Continue with pricking out if transplants are to be used.. Prepare all land to be planted by cross-ploughing and harrowing. A well prepared soil is a good fertiliser; it assists establishment and reduces failures

POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, bnt it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come through it best. More green and animal food should be given, and the utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt te fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or maize daily. The grazing should be improving rapidly in feeding value. If normal rains have fallen, the grass should be sufficient for cows of average production. Heavier milkers should be fed concentrates at the rate of about 3 lbs. per gallon of milk produced over the first. In most cases maize meal alone will be sufficient for the purpose.

Sheep.—Dip sheep; put the rams to the ewes; keep the sheep on high dry land; be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

DAIRYING.

In a normal year veld grazing should be plentiful in November, and the feeding of dairy stock is then very much simplified; veld grass in a green and succulent condition is practically all that is required for animals of less than average production. Heavy milking cows, however, on early pasture, require extra feed in the form of concentrates, while the latter should always be fed to dairy stock which are in poor condition at this time of the year. Young calves should not be turned out to graze with the herd, and in wet weather are best kept in a clean, dry, airy pen. Weaned stock, which have not hitherto had access to green pasture, should be gradually accustomed to the change in diet and may at first be turned out to graze for short periods. Young stock on pasture should also receive a small daily allowance of concentrates.

Farmers supp'ying cream to the creamery should adjnst the cream screw to the separator so that the latter will separate a cream testing 45 to 50 per cent. butter fat. Cream of this consistency will keep better than thinner cream. It should be borne in mind that it is practically impossible to produce first-grade cream if the cattle are milked in a muddy kraal. In the absence of a cow shed, every endeavour should be made to erect a small milking shed in which four or five cows can be tied, milked and fed. A small shed of this kind is also essential to obtain clean milk for cheese-making. Milking in a muddy kraal invariably results in a gassy, bitter cheese being produced.

The shelves of the cheese room should be scrubbed with boiling water and soda, and for the last rinsing a weak solution of formalin may be used. This should prove effective in controlling cheese pests.

TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out. Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows. In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland generally, with the exception of the eastern border, where it amounts to five inches. Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

December.

BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there will be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra ventilation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee, which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shallow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering. If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil. All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality. Continue to rub off all water shoots or suckers which develop on the tree stems.

CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons. Linseed, cowpeas, teff grass, oats, Sunn hemp should be planted after the other crops are in. Ensilage crops may be sown at the end of the month. When harrowing maize after planting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken. On lands not yet planted the crop of weeds should be kept down by disc-harrowing. It is a good plan to harrow or disc-harrow immediately before the planter, or alternatively to follow the planter with a light harrow. Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for

ten minutes. Earth up early planted potatoes. Keep a look out for the stalk-borer, and top or otherwise treat affected plants. New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again-ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good, clean ploughing to be done. Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits. Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature. Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet. Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and are easily poisoned.

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. Planting should be carried out on dull, rainy days, or failing such days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as

much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Feeding should be continued on the same lines as in November. Keep a close eye on any store bullocks that have been selected for fattening on grass.

Ranching cattle should not require any attention beyond dipping. Every effort should be made to have all the female stock in good condition for the breeding season.

Milch cows should be protected as much as possible from cold rains and hot sun. Yarding at night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf-pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks. Take out the rams at the end of the month.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on well prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

SOUTHERN RHODESIA VETERINARY REPORT.

August. 1932.

AFRICAN COAST FEVER.

Rocklands Estate.—The process of removing the infected herds through temperature camps to clean veld was completed. Mortality during the month from Coast Fever, 3 head.

Laughing Waters.—The removal of the infected herd to clean veld was completed. No cases of Coast Fever occurred.

FOOT AND MOUTH DISEASE.

GWELO VETERINARY DISTRICT.

In the Gwelo district a fresh outbreak occurred on farm Sonambula No. 6. The infected and several adjoining herds were inoculated.

UMVUMA VETERINARY DISTRICT.

At the Central Estates the results of the inoculation were most satisfactory.

BULAWAYO VETERINARY DISTRICT.

Insiza District.—The cattle moved from the Mbondu dipping tank area to the Siwazi area for inoculation have completely recovered and will be returned to their kraals about the middle of September.

Belingwe District.—The disease in this district has cleared up completely and all cordons have been released.

Gwanda District.—The cattle inoculated on Olympus Block recovered completely and at the end of July were returned to their original grazing grounds.

A fresh infection was found on the 3rd in Magayas dipping tank area on Railway Block No. 2 and on the 5th was also found at Dubanes tank area which includes farms extending northwards to the West Nicholson-Thornwood Block Road. All the cattle involved were concentrated and inoculated. As a further precaution a cattle free belt was established between the Mtshibizini River and the Gwanda-Sengazbaan road to the Store on the Tuli River and a cordon placed completely around this belt. All cattle on Oakley Block and Doddiburn Ranch were also inoculated.

A further outbreak was discovered on the farm Deneys on the 28th. It appears that the infection was carried to this farm by certain animals which had strayed from it and probably contracted the disease at Railway Block No. 2. The infected herd was moved to Oakley Block and 529 head of immune cattle, also on Deneys, were moved to Cleveland Block.

The total number of cattle inoculated during the month was 28,819.

TRYPANOSOMIASIS.

Six deaths reported from the eastern border, Melsetter district, and several cases in the Darwin district.

MYIASIS (SCREW WORM IN CATTLE).

Reports in several districts.

SCAB.

One flock placed under licence in Melsetter district.

IMPORTATIONS.

From the Union of South Africa and Bechuanaland Protectorate: *Bulls 2, horses 5, sheep 1,016, goats 112, pigs 24.*

EXPORTATIONS.

Nil.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

SOUTHERN RHODESIA WEATHER BUREAU.

SEPTEMBER, 1932.

Pressure.—The mean pressure for the month was generally very low. Pressure conditions were normal early in the month,. but deep lows appeared in the last decade and unusually low pressure was recorded.

Temperature.—Mean monthly temperature was everywhere well above normal.

Rainfall.—Light showers occurred at intervals on the Eastern Border. In conjunction with the low pressure, thunderstorms commenced in the N.E. on the 25th and 26th. Scattered showers were reported on the 27th and 28th, and on the 29th and 30th thunderstorms occurred in the S.W. and South.

SEPTEMBER, 1932.

Station.	Pressure Millibars, 8.30 a.m.		Temperature in Stevenson Screen ° F.								Rel. Hum.	Dew Point	Cloud Amt.	Precipitation.			Altitude (Feet).
			Absolute.		Mean.												
	Mean.	Normal.	Max.	Min.	Max.	Min.	½ Max. Min.	Normal.	Dry Bulb.	Wet Bulb.	%	F.	0-10	Ins.	Normal.	No. of Days.	
Bulawayo ...	870.1	870.9	93	44	83.7	54.6	69.2	67.5	69.5	54.5	36	41	2.5	0.27	0.2	4	4,436
Gwelo	864.2	...	92	40	82.9	55.6	69.3	67.4	68.2	55.6	44	45	2.5	0.52	0.2	2	4,632
Riverbank ...	...	...	100	41	90.6	56.9	73.8	71.0	69.0	54.3	36	42	...	0.37	0.2	1	4,100
Essexvale ...	...	...	102	34	91.0	53.5	72.3	69.0	66.3	55.2	48	46	...	0.11	0.2	1	3,828
Gwanda ...	907.3	...	97	39	87.2	57.7	72.5	...	72.2	57.0	37	45	2.1	0.38	0.2	1	3,235
Mazunga ...	949.6	951.7	102	45	90.0	56.9	73.5	71.8	72.5	62.0	55	55	2.8	...	0.2	...	1,970
Nuanetsi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.2	...	1,630
Between Rivers	...	...	95	40	87.8	54.2	71.0	...	70.5	56.6	41	45	0.7	...	0.4	...	3,970
Enkeldoorn ...	859.3	...	92	44	81.7	55.0	68.4	67.0	68.9	56.7	45	47	2.0	0.16	0.1	1	4,720
Gatooma ...	...	...	97	47	87.7	56.5	72.1	71.0	69.5	56.4	43	45	3.8	0.01	0.1	1	3,850
Miami	880.2	...	91	46	83.5	57.2	70.4	...	71.6	58.1	43	48	0.2	...	...	...	4,090
Salisbury ...	856.4	857.1	90	44	81.1	56.3	68.7	66.6	68.3	55.8	45	47	1.4	...	0.3	...	4,890
Sinoia ...	...	...	95	41	86.8	53.7	70.3	..	72.6	58.4	42	48	0.6	0.04	0.3	1	3,804
Sipolilo... ...	...	...	92	50	83.3	61.0	72.2	...	72.8	57.8	38	46	0.9	...	0.1	...	3,900
Mtoko	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4,210
Shamva ...	...	...	96	45	87.2	57.6	72.4	...	72.1	59.2	46	50	1.6	...	0.1	...	3,170
Angus Ranch ...	...	...	101	52	88.9	62.4	75.7	70.9	72.6	60.9	50	53	...	...	0.1	...	2,300
Craigendoran ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
New Year's Gift	...	...	101	50	86.5	58.4	72.5	...	69.7	59.8	56	53	...	...	0.3	...	2,700
Nyamasanga ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5,080
Riverdene North	...	...	96	30	86.4	51.2	68.8	...	66.6	57.4	57	51	...	0.09	0.3	1	3,700
Stapleford ...	...	...	81	33	69.8	48.8	59.3	...	64.1	55.7	58	49	1.8	0.03	0.4	2	5,450
Umtali	894.7	895.9	94	45	82.1	56.6	69.4	67.4	69.9	59.9	55	53	2.1	0.04	0.5	1	3,677
Victoria ...	897.1	898.1	97	42	84.8	54.6	69.7	66.1	69.2	...	...	...	2.5	...	0.2	...	3,570
Melsetter ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.5	...	5,060
Mount Selinda	...	...	89	47	80.3	55.3	67.8	...	66.9	58.3	59	52	2.5	0.04	1.1	1	3,520
Manchester ...	...	...	85	42	73.5	51.6	62.6	...	55.2	51.7	79	48	...	0.06	...	2	...

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. Application should be made to the Editor, Department of Agriculture, Salisbury, and remittances must accompany orders.

AGRICULTURE AND CROPS.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 374. Fibre Crops—Deccan Hemp (Hibiscus Cannabinus) and Sunn Hemp (*Crotolaria Juncea*), by J. A. T. Walters, B.A.

No. 429. Propagation of Kudzu Vine, by H. C. Arnold.

No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.

No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.

No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.

No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.

No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

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No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.

No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.

No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.

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No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.

No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.

No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.

No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

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No. 757. Maize on the Sand Veld : Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.

No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.

No. 759. Witch Weed (Striga Lutea) : Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.

No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).

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No. 802. Witch Weed, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.

No. 807. Studies on the Improvement of Natural Veld Pastures: No. 2, by A. D. Husband, F.I.C., and A. P. Taylor, M.A., B.Sc., Chemistry Branch, Department of Agriculture.

No. 813. A Preliminary Note on Clovers in Southern Rhodesia, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 815. New Strains of Oats for Southern Rhodesia, by H. C. Arnold, Manager, Agricultural Experiment Station, Salisbury.

No. 816. Preliminary List of the more Common Grasses of Southern Rhodesia, by Sydney M. Stent, Botanist for Pasture Research.

No. 820. The Great Economic Problem in Agriculture—No. 1, by J. R. McLoughlin, M.Sc. (Economics), Economic Adviser.

No. 822. Re-stacking of Maize rejected for Export on account of Excessive Moisture.

No. 823. The Law of Supply and Demand—No. 2, by J. R. McLoughlin, M.Sc. (Economics), Economic Adviser.

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No. 831. Revised Notes on Cotton Growing in Southern Rhodesia, by G. S. Cameron.

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No. 837. Veld Grass Silage—A Feature in Rhodesian Pasture Management, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief, Division of Plant Industry.
No. 838. Witch Weed—Progress Report and a Warning, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.
No. 841. Poisonous or Suspected Poisonous Plants of Southern Rhodesia: Tulp Poisoning of Cattle, by Sydney M. Stent, Senior Botanist, and D. A. Lawrence, B.V.Sc., Veterinary Research Officer.
No. 855. Pigeon-hole Method of Stacking Maize, by Division of Plant Industry.
No. 859. Twenty-one Years of Plant Introduction, by Major Mundy, Chief, Division of Plant Industry.

REPORTS ON CROP EXPERIMENTS.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. *Salisbury Agricultural Experiment Station Annual Report.* 1927-28, by H. C. Arnold.
No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.
No. 789. *Agricultural Experiment Station, Salisbury: Annual Report of* Experiments, 1928-29, by H. C. Arnold, Manager.
No. 800. Bulawayo Municipal Experiment Station: Report for the Season 1929-30, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.
No. 806. Gwebi Demonstration Farm, by the *Chief Agriculturist.*
No. 810. Gwelo Municipal Demonstration Station: Annual Report, 1929-30, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.
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No. 842. Gwelo Municipal Demonstration Station: Annual Report, 1930-31, by D. E. McLoughlin, Assistant Agriculturist.
No. 851. Bulawayo Municipal Demonstration Station: Final Report, 1932, by D. E. McLaughlin, Assistant Agriculturist.

TOBACCO.

No. 605. Flue-curing Tobacco Barns, Bulking and Grading Sheds, by *P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.*
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
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